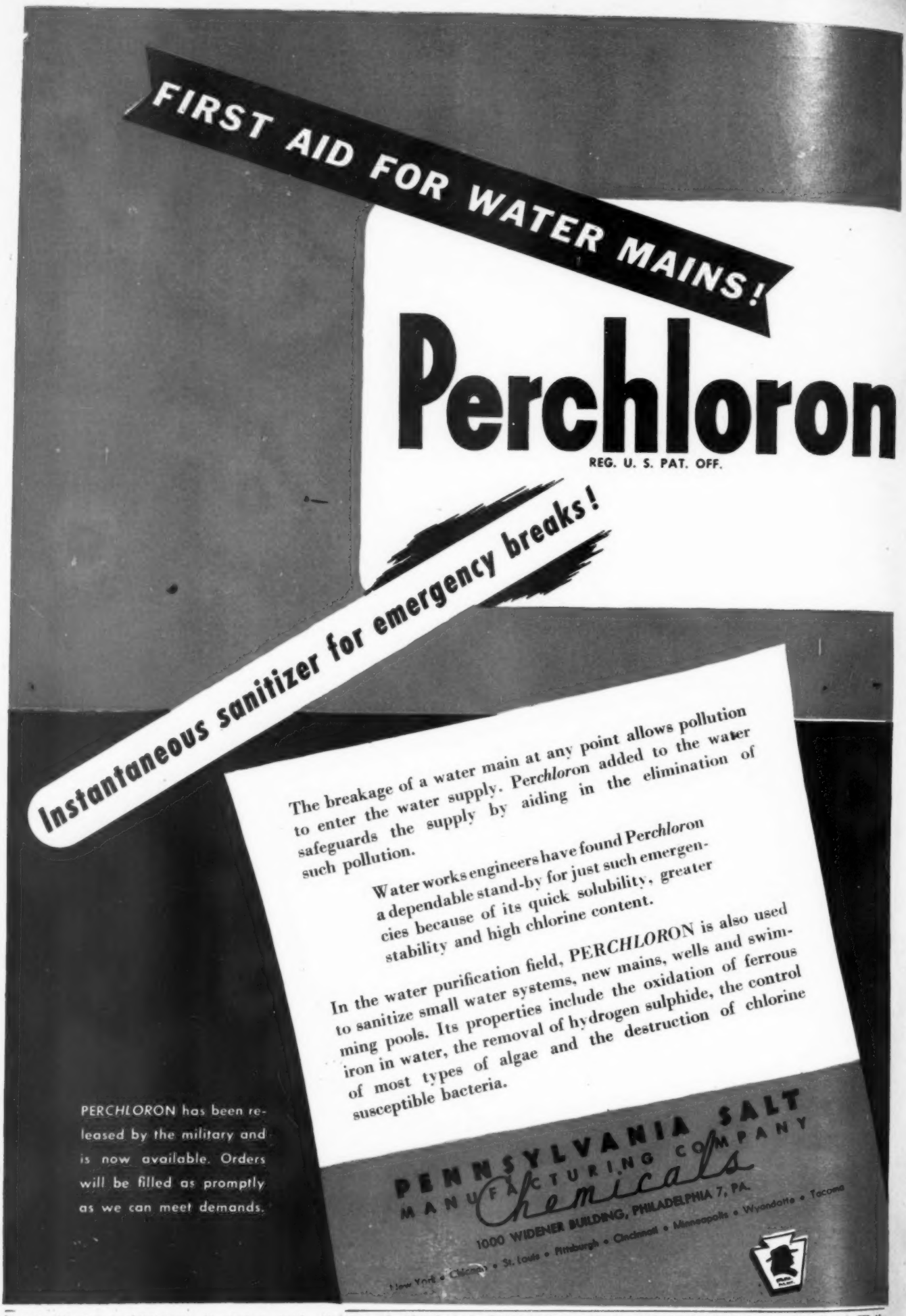
WATER WORKS & SEWERAGE

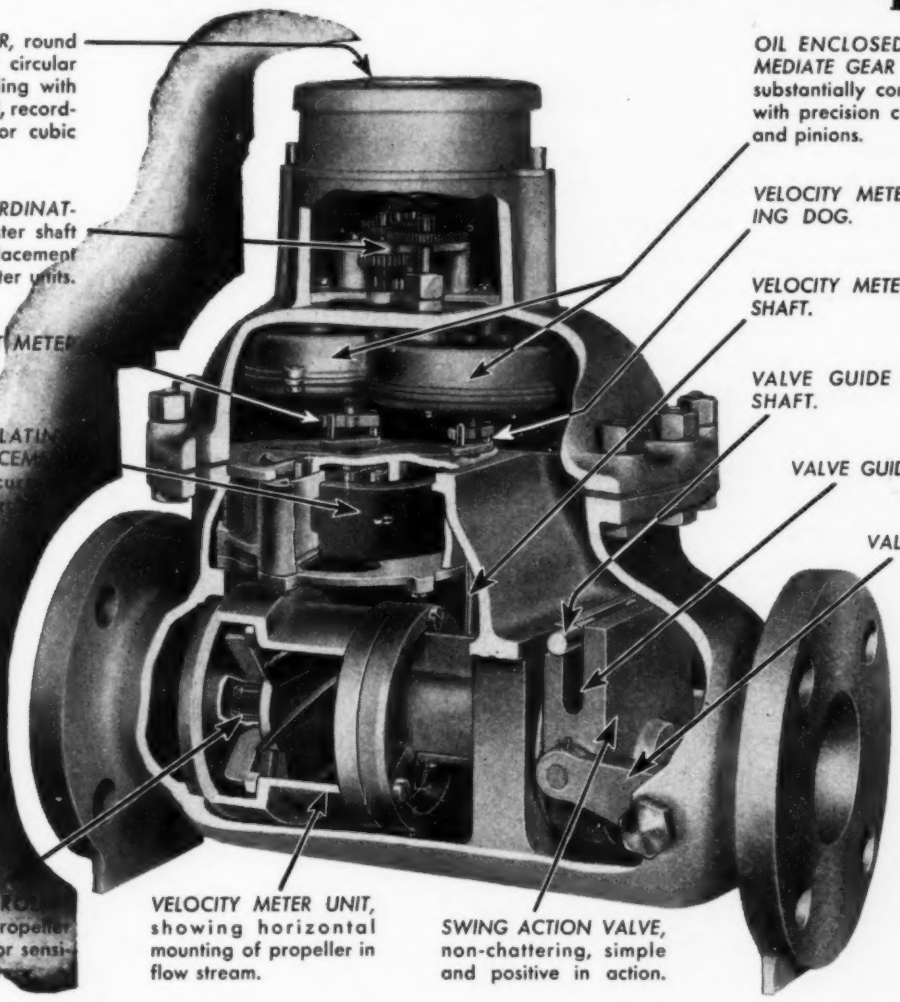

FIRST AID FOR WATER MAINS!
Perchloron
REG. U. S. PAT. OFF.
Instantaneous sanitizer for emergency breaks!
The breakage of a water main at any point allows pollution to enter the water supply. Perchloron added to the water safeguards the supply by aiding in the elimination of such pollution.
Water works engineers have found Perchloron a dependable stand-by for just such emergencies because of its quick solubility, greater stability and high chlorine content.
In the water purification field, PERCHLORON is also used to sanitize small water systems, new mains, wells and swimming pools. Its properties include the oxidation of ferrous iron in water, the removal of hydrogen sulphide, the control of most types of algae and the destruction of chlorine susceptible bacteria.
PERCHLORON has been released by the military and is now available. Orders will be filled as promptly as we can meet demands.
PENNSYLVANIA SALT MANUFACTURING COMPANY
Chemicals
1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
New York • Chicago • St. Louis • Pittsburgh • Cincinnati • Minneapolis • Wyandotte • Tacoma

Water Works & Sewerage, December, 1945. Volume 92, Number 12. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under act of March 3, 1879.

Here's the inside story

about a revolutionary **NEW** meter

the PITTSBURGH·EMPIRE Compound



SINGLE REGISTER, round dial type either circular or straight reading with sweep test hand, recording in gallons or cubic feet.

REGISTER COORDINATOR, drives register shaft from both displacement and velocity meter units.

DISPLACEMENT METER DRIVING DOG.

EMPIRE OSCILLATING PISTON DISPLACEMENT METER, for accurate measuring low rates of flow.

OIL ENCLOSED INTERMEDIATE GEAR TRAINS, substantially constructed with precision cut gears and pinions.

VELOCITY METER DRIVING DOG.

VELOCITY METER DRIVE SHAFT.

VALVE GUIDE ROLLER SHAFT.

VALVE GUIDE SLOT.

VALVE LINK.

HARD RUBBER ROLLER BEARINGS in propeller shaft mounting for sensitivity and long wear.

VELOCITY METER UNIT, showing horizontal mounting of propeller in flow stream.

SWING ACTION VALVE, non-chattering, simple and positive in action.

PITTSBURGH EQUITABLE METER COMPANY

MERCO NORDSTROM VALVE CO.

Subsidiaries of Rockwell Manufacturing Company

MAIN OFFICES: PITTSBURGH 8, PA.

Atlanta Pittsburgh Houston Tulsa Kansas City San Francisco Los Angeles Seattle New York Boston Chicago

water meters

HIGHER OPERATING EFFICIENCIES

at 15... or 150 MGD Flow

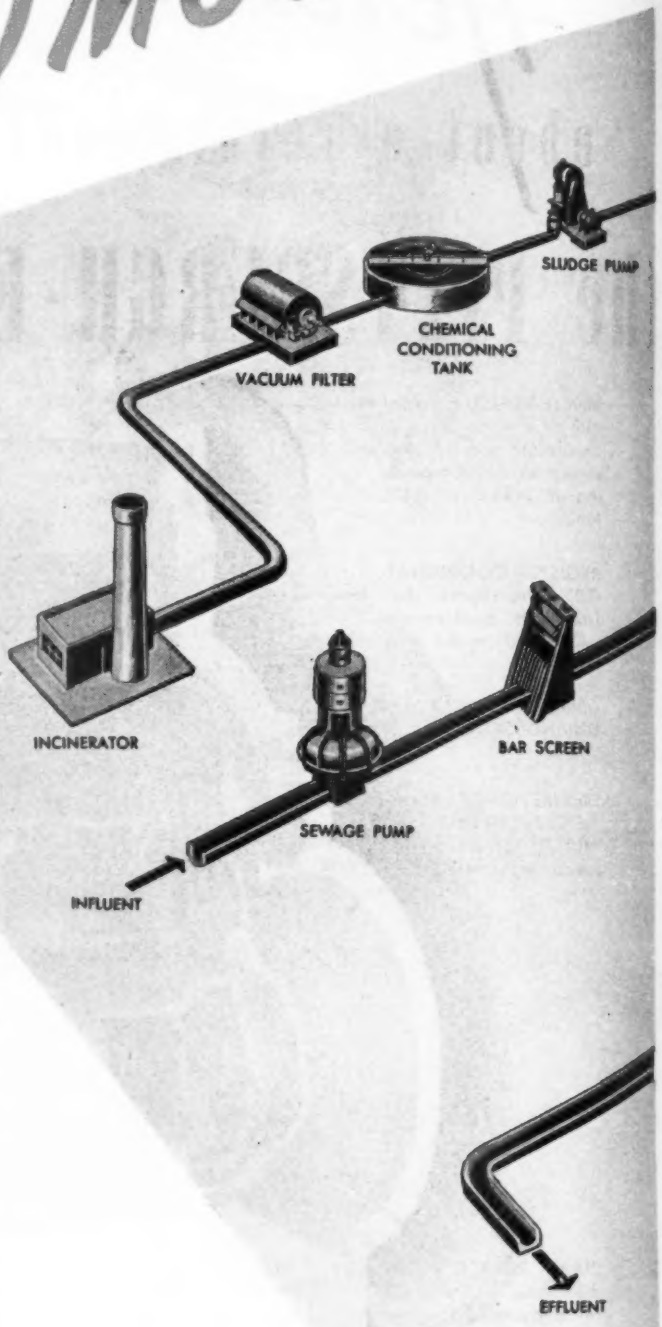
... obtained with Westinghouse synchronous motor pump drive and associated electrical drives co-ordinated from influent to effluent.

To provide adjustable pumping capacity to match variable heads and sewage flows in the Buffalo Sewage Disposal Plant, two of six pumps were equipped with dual Westinghouse synchronous motors, both on the same shaft. This made possible the selection of either of two speeds, with resultant change in pumping capacity. It assured the high efficiency and power factor inherent in synchronous motors.

The dependability and efficiency of Westinghouse motor drives have been demonstrated in scores of sewage treatment plants. In the modern Buffalo Sewage Disposal Plant, for example, Westinghouse supplied 335 electric motors . . . of all types, completely co-ordinated by Westinghouse control boards and switchgear for highly efficient handling of a 150 MGD flow. One of the two-speed synchronous motor sewage pump drives is illustrated on the opposite page.

Whether the drive requires ¼ horsepower, or 5,000 —50 motors or 500—Westinghouse can help you select and apply the right motor drive and control . . . by a co-ordinated service which includes all equipment from power transformers to pushbuttons.

Westinghouse today is helping many cities in their "Blueprint Now" plans. Ask Westinghouse to be your electrical partner at the planning board. Call your Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94689

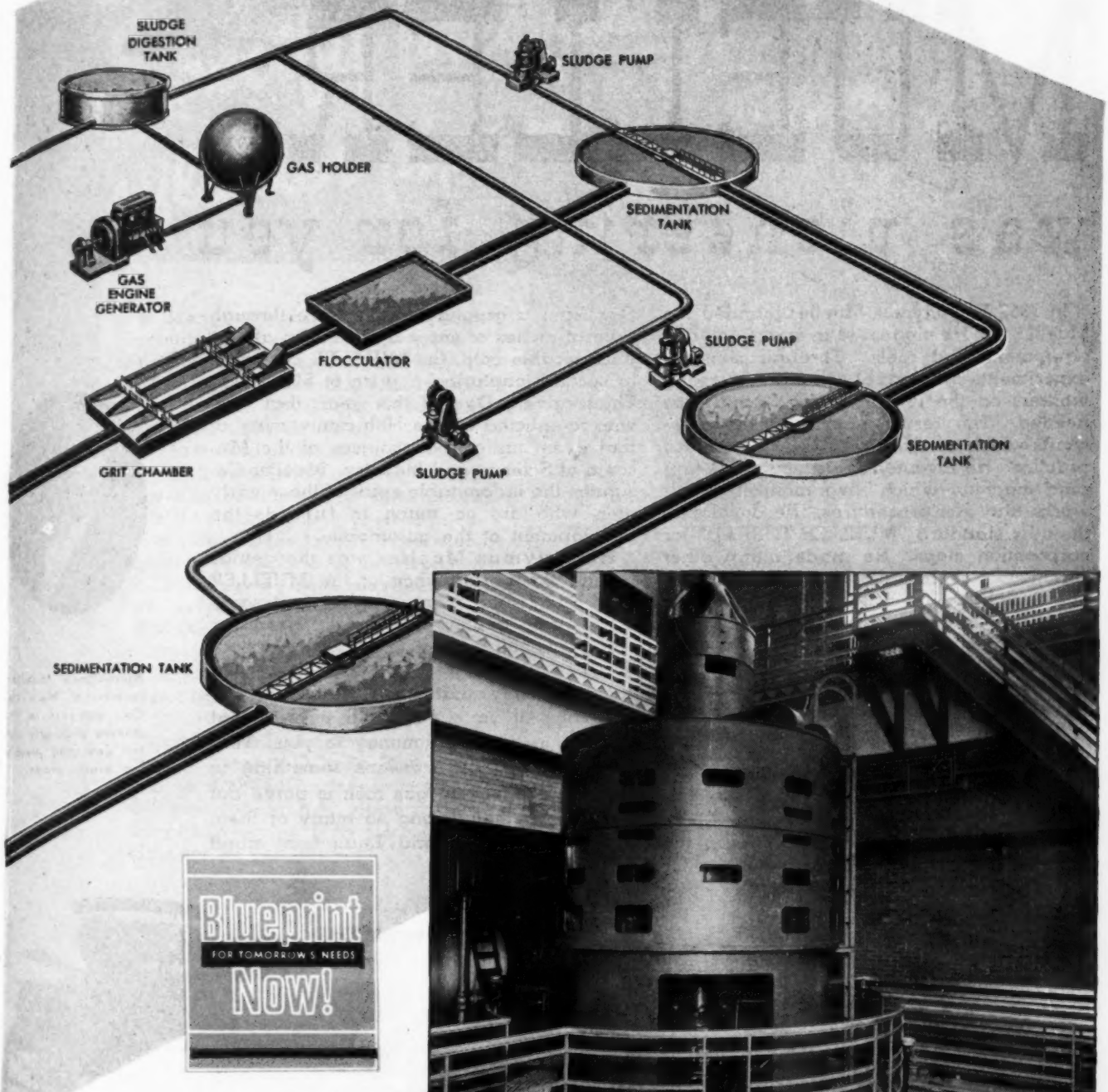


Westinghouse

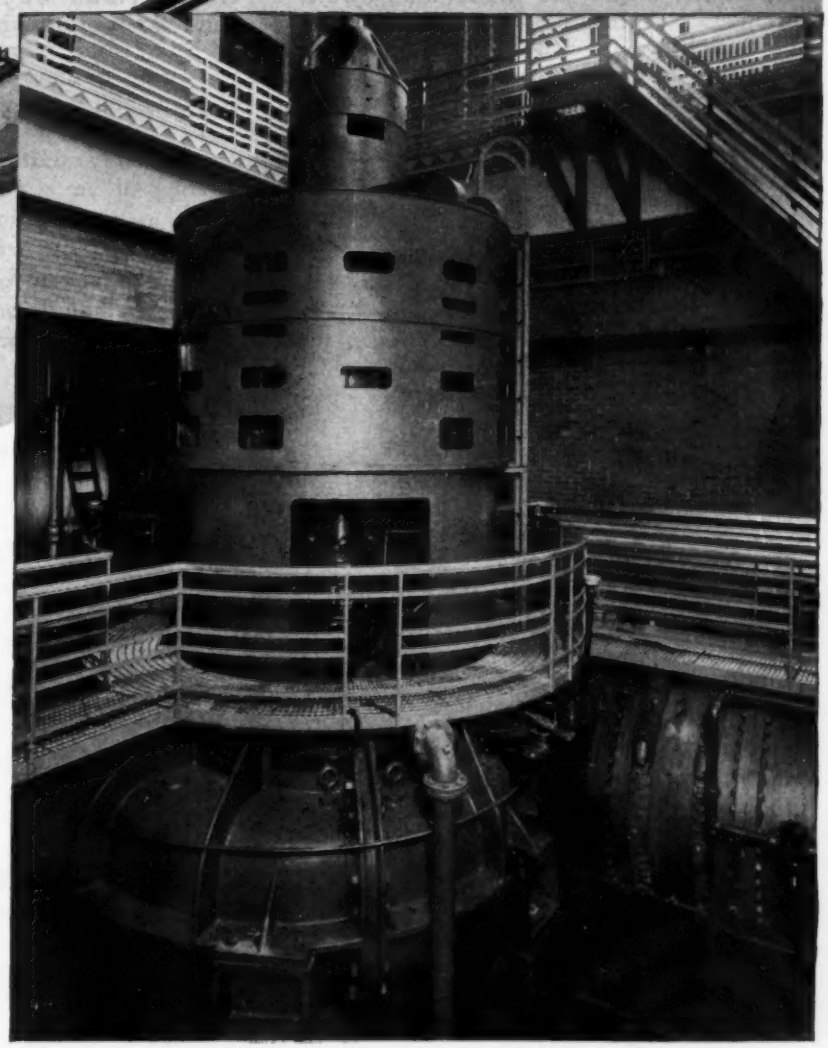
PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Complete Electrical Equipment for Sewage Works

THERE IS A WESTINGHOUSE MOTOR FOR ANY SEWAGE WORK DRIVE



Blueprint FOR TOMORROW'S NEEDS Now!



Westinghouse two-speed vertical synchronous motor driving a 60" vertical volute bottom suction sewage pump with a 60" automatic butterfly discharge valve—at Buffalo, New York, Sewage Disposal Plant. Motor rating is 550/375 hp, 180/157 rpm, 4160 volts, 3 phase, 60 cycles. Pump rating is 120 MGD at 23 feet TDH at 180 rpm, and 100 MGD at 18 feet TDH at 157 rpm.

WESTINGHOUSE

. . . 88 years ago

MUELLER

was pioneering for you

In 1857 Hieronymus Mueller founded the Mueller Co. He pioneered in water and gas equipment and tools. Through constant experiments and actual contact with many workers on the job he learned what was needed. The result was many improvements which are now accepted as standard practice. He invented the drilling and tapping machine which revolutionized water works and gas procedures. He developed the now standard "MUELLER THREAD" for corporation stops. He made many other significant contributions to the industry, and time has proven them to be sound.

But these were not his only projects. Mr. Mueller became interested in "horseless carriages", and built several of the early models in America. One of them was entered in the first automobile race ever held in the United States. That race was run on November 28, 1895 in Chicago. The course ran from Jackson Park to Evanston and back, a distance of fifty-two miles. There were six entries, four gasoline driven and two with electric motors. One of the gasoline cars was entered by the Mueller Co. After a grueling all-day ride through several inches of snow and sleet in almost unendurable cold, the MUELLER car came in second, capturing a prize of $1500. On Thanksgiving Day of this year, that race was re-enacted on the 50th anniversary of that event under the auspices of the Museum of Science and Industry. Mueller Co. salutes the indomitable spirit of those early men who did so much to further the development of the automobile.

Hieronymus Mueller was the genius behind the performance of the MUELLER car. That same pioneer spirit, that same engineering genius that characterized our founder is still present in our organization. Many improvements have been developed since his day that have added to the efficiency of your work and have meant savings in time and money to you. That the name MUELLER means something to water, sewage, and gas men is borne out by the fact that among so many of them MUELLER Tools and Equipment stand FIRST!

Hieronymus Mueller, founder of Mueller Co., pioneers in the making of quality water, gas, and plumbing brass goods.

THE IMPROVED MUELLER MOTOR CARRIAGE

In commemoration of the 50th Anniversary of the first automobile race in America we have printed a special FREE souvenir edition of the "MUELLER RECORD". If you have not received your copy, write us today and mention this magazine.

MUELLER CO.

DECATUR 70, ILLINOIS

Chattanooga, Tenn. Los Angeles, Calif. Sarnia, Ontario, Canada

WATER WORKS ENGINEERS

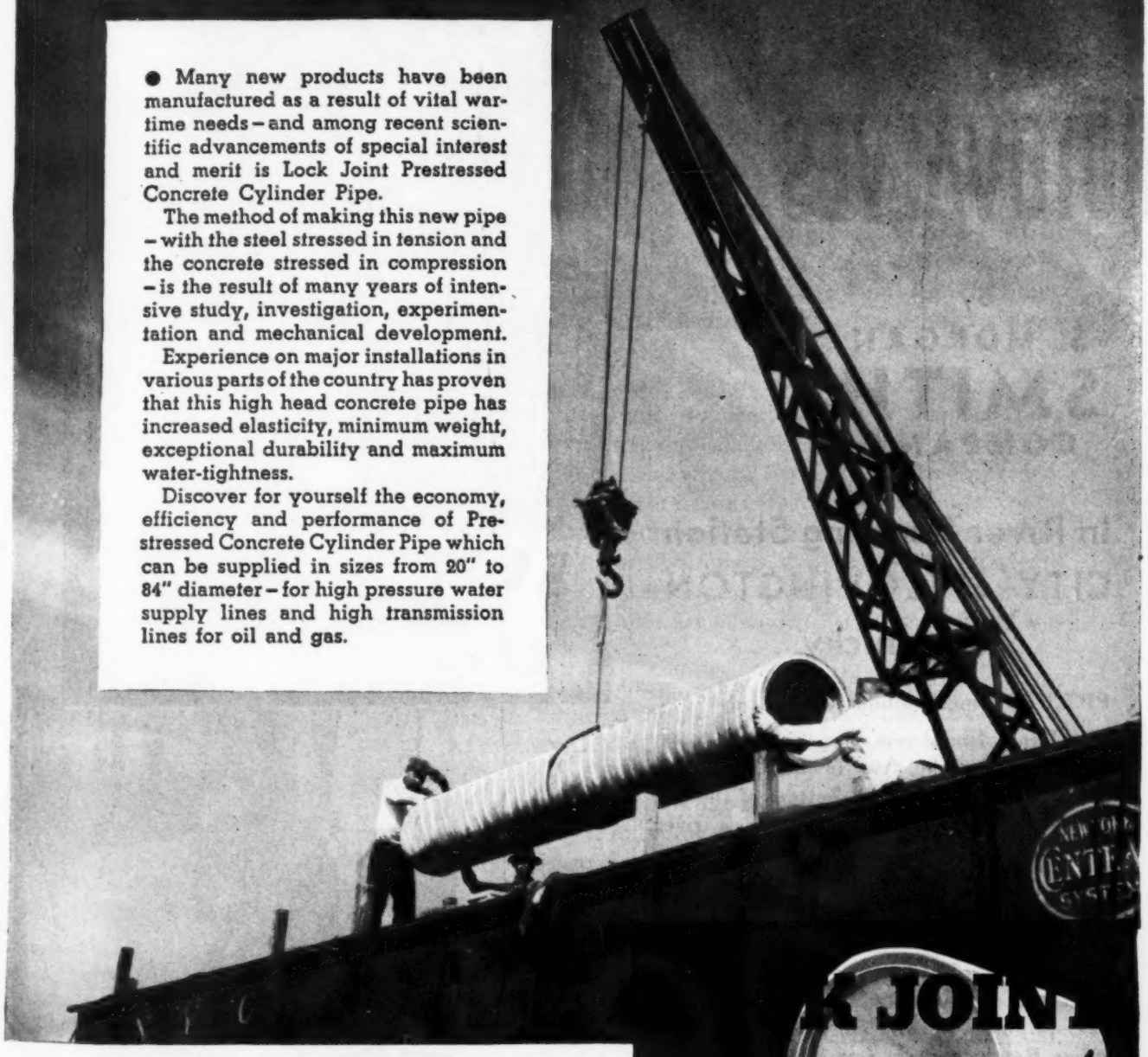
Specify prestressed concrete cylinder pipe on your next job

● Many new products have been manufactured as a result of vital wartime needs – and among recent scientific advancements of special interest and merit is Lock Joint Prestressed Concrete Cylinder Pipe.

The method of making this new pipe – with the steel stressed in tension and the concrete stressed in compression – is the result of many years of intensive study, investigation, experimentation and mechanical development.

Experience on major installations in various parts of the country has proven that this high head concrete pipe has increased elasticity, minimum weight, exceptional durability and maximum water-tightness.

Discover for yourself the economy, efficiency and performance of Prestressed Concrete Cylinder Pipe which can be supplied in sizes from 20" to 84" diameter – for high pressure water supply lines and high transmission lines for oil and gas.



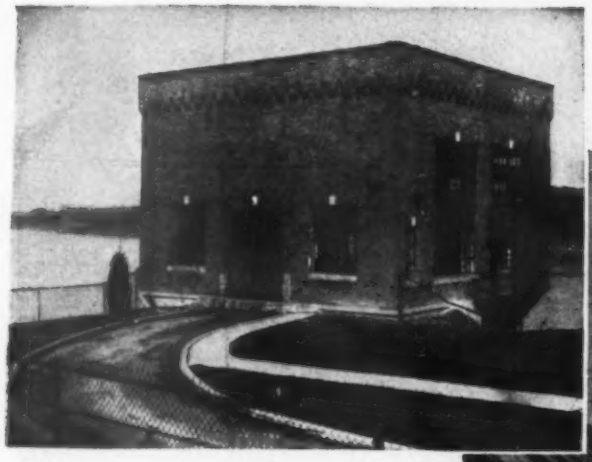
LOCK JOINT PIPE COMPANY

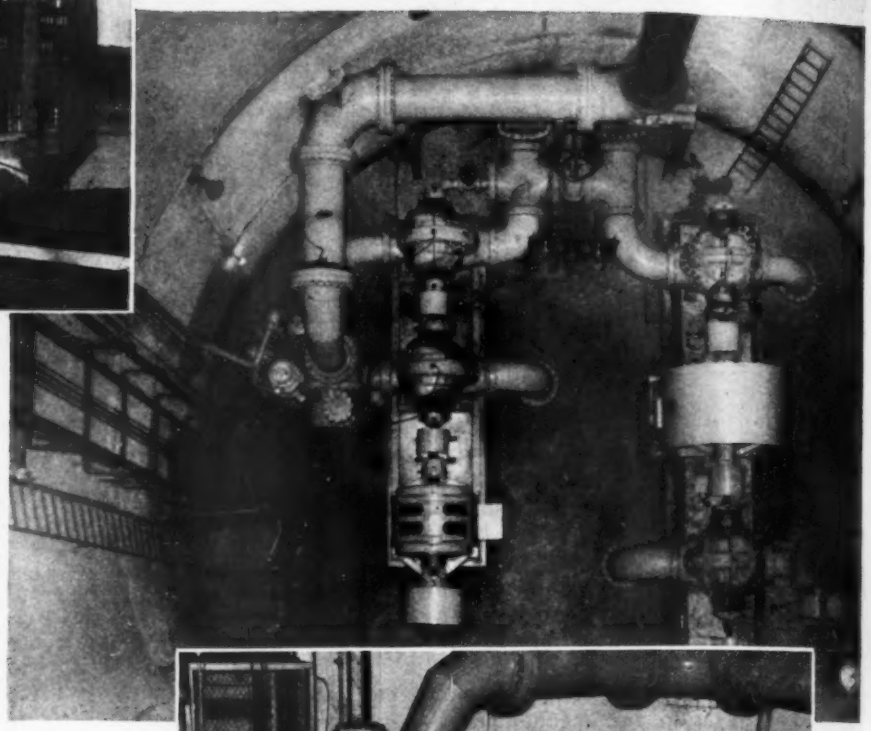
Established 1905

P. O. BOX 269, EAST ORANGE, N. J.

Denver, Colo. • Chicago, Ill. • Kenilworth, N. J. • Kansas City, Mo. • Rock Island, Ill.
Joplin, Mo. • Valley Park, Mo. • Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

SCOPE OF SERVICES *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.*

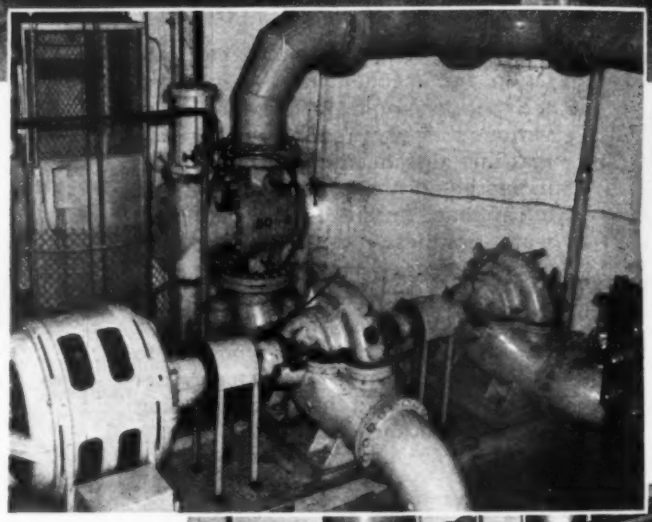




ROTOVALVES

by
S. MORGAN
SMITH
COMPANY

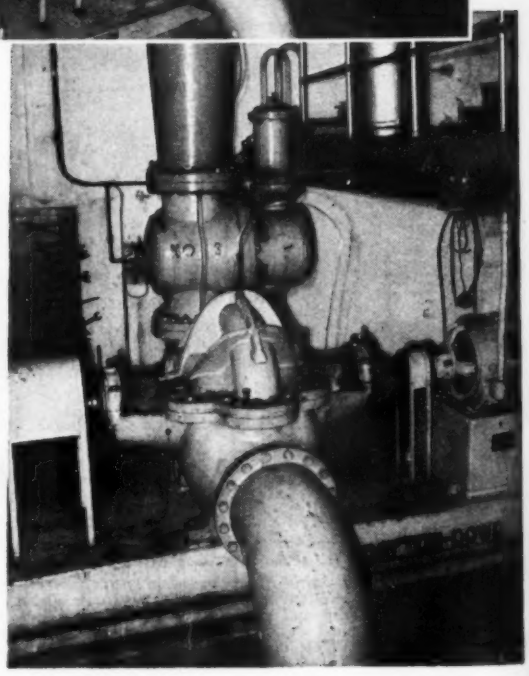
In River Pumping Station
CITY of COVINGTON
. Kentucky .



PICTURES speak louder than words!

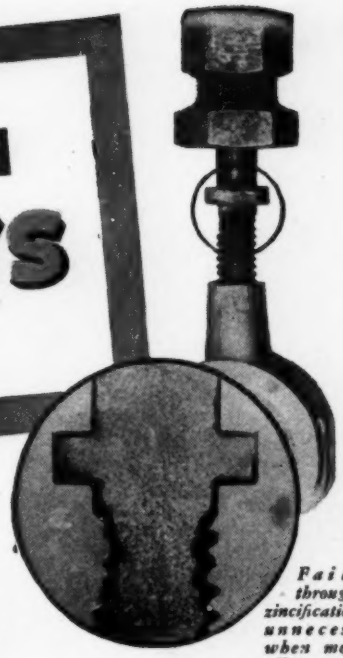
The Pump House sets over a dry well—80 feet deep and 40 feet in diameter. The pumps are located at the bottom of the pit, which is at the level of the lowest river stage. In time of flood, the water rises as much as 70 feet. Two 10 m.g.d. pumps deliver water at 400 foot head, through 4,000 feet of 30" line to the Raw Water Reservoir at the Filtration Plant.

Here is a pumping station where reliability of equipment is unusually essential. Five other Rotovalves are installed in the Covington Water Works System!



S. MORGAN SMITH COMPANY
YORK • PENNSYLVANIA

FIGHT CORROSION WITH DURONZE* ALLOYS



Failure through dezincification is unnecessary when modern alloys are used.

...to prolong service life of your equipment!

When a vulnerable part of an otherwise excellent product failed prematurely, investigation disclosed dezincification from the corrosive action of artesian well water containing carbon dioxide. Had the part been made from Duronze III (silicon aluminum bronze) its useful life would have been greatly extended without much increase in first cost.

Bridgeport's Duronze III, however, does far more than provide excellent resistance to corrosion. It is very hard and strong, with a tensile strength of about 85,000 psi in rod form when annealed—yet machines freely. Because of its low coefficient of friction Duronze III withstands wear and abrasion when in slow moving contact with steel, brass or other materials. Add all these favorable inherent properties to its 9% lighter weight than brass, and you have an ideal material for many water works and sewerage parts which are intended for long years of uninterrupted service.

Duronze III valve stems resist corrosion and wear, and last many times longer.

The five Duronze alloys, with their individual yet related properties, are contributing to improved performance of varied industrial products. They can help you with product improvement plans for water and steam valves, water meter bolts and nuts, pump parts, compression fittings or in fact any part that must fight corrosion. Write today for your copy of the newly published 128-page Bridgeport Technical Handbook which will bring you up-to-date on latest developments. Please use company stationery.

"Bridgeport" BRIDGEPORT BRASS COMPANY • BRIDGEPORT 2, CONN. *Established 1865*

**Reg. U. S. Pat. Off.*

Duronze Alloys—PRODUCTS OF

BRIDGEPORT BRASS

You get economy...durability in CONCRETE PIPE LINES

Installing 72-inch concrete pipe for combined sanitary and storm sewer outfall for International Harvester Co. plant at Memphis, Tenn. Taylor & Wheeless, contractors, Hattiesburg, Miss.

The engineering factors that insure durability and efficient service have been demonstrated by concrete pipe in thousands of sewerage, drainage and water supply installations.

When you specify concrete pipe you get:

AMPLE STRENGTH to resist loads and impacts.

MAXIMUM HYDRAULIC CAPACITY because of smooth, true interior finish.

And in addition, concrete pipe offers the advantages of:

HIGH WEAR RESISTANCE to abrasion.

MINIMUM INFILTRATION AND LEAKAGE—because of tight joints and dense concrete.

MODERATE FIRST COST—LOW ANNUAL COST.

All these advantages mean that concrete pipe installations have long life at low maintenance expense which contribute to *low annual cost* —the true measure of economy in pipe lines.

PORTLAND CEMENT ASSOCIATION

Dept. A12- 29,33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

Wilson PULSAFEEDER

UP TO 500,000 GALLONS DAILY

For water systems for which peak demand does not exceed 500,000 gallons per day, the Pulsafeeder type of hypochlorinator is more economical and more satisfactory than gas chlorination.

CONTINUOUSLY ADJUSTABLE WHILE IN OPERATION

Rate of feeding with Wilson Pulsafeeders is continuously adjustable, from zero to maximum flow, by simple turning of a micrometer knob on the side of the machine, while Pulsafeeder is in operation. Meter-controlled model is actuated by water meter, provides exactly proportioned feeding at all rates of flow.

HYDRAULICALLY-BALANCED DIAPHRAGM HEAD

Exclusive Pulsafeeder construction is an hydraulically-balanced diaphragm which isolates the piston and cylinder from the chemical solution being pumped. No packing glands required. No corrosive attack on pump parts by chemical solutions.

MULTIPLE-HEAD PULSAFEEDERS

Pulsafeeders are available in models with one, two, three or four heads, all driven by the same motor. Solutions for hypochlorination, ammoniation, algae control, pH control, color, odor or taste control may be fed in any combination, in exactly proportioned rates.

SEALED-IN LUBRICATION

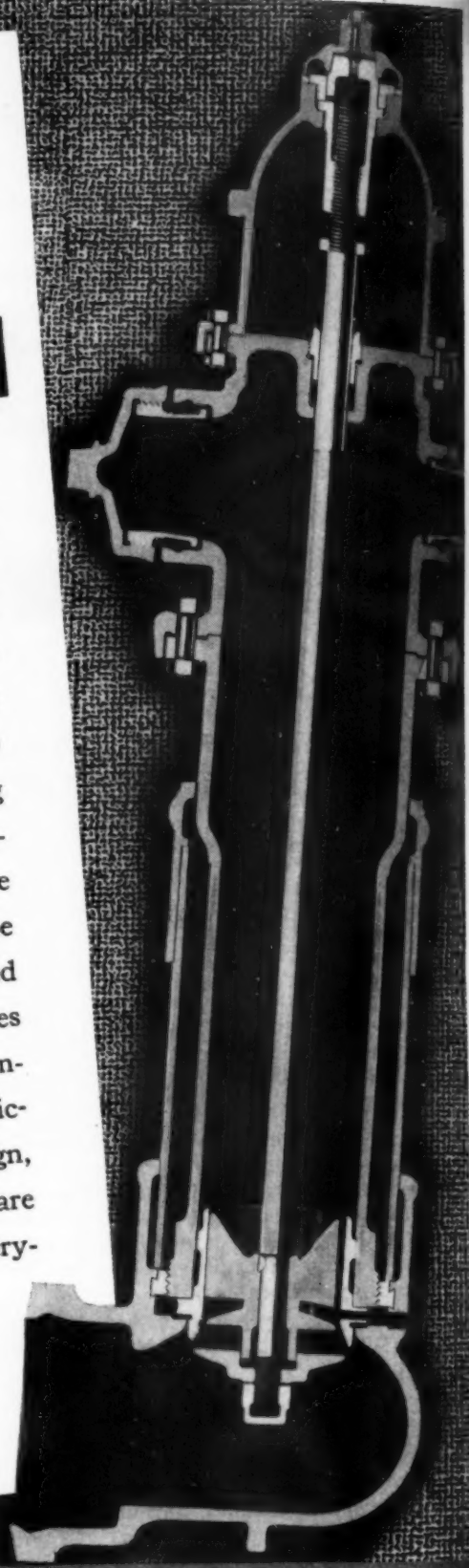
All working parts of the Pulsafeeder—except the motor—are enclosed in a housing and run in an oil bath. Minimum maintenance required, long life assured.

Illustrated literature and specifications—also data sheet for factory recommendations on *your* requirements—available on request. *Process Equipment Division, Lapp Insulator Co., Inc., 113 Maple St., LeRoy, N. Y.*

Lapp

IT'S COZY INSIDE

That Mathews on the street-corner, standing guard by day and cold December night, knows no Winter inwardly. It may be deep-buried in snow and ice, but inside all is dry, all is well. For the low-placed orifice *drains all the water out*. Ice can't form. Mathews Hydrants have been the world's standard for over 60 years. Some of the other reasons: All working parts contained in a removable barrel, replaceable in a few minutes; service can't be interrupted long; the pavement need not be broken; head can be rotated 360°; can be raised or lowered as desired; opens *against*, closes *with* pressure; large water-carrying areas; cannot rust; greased or oiled from outside; all friction-points bronze-protected. Simple in design, rugged, trouble-free, Mathews Hydrants are giving 24-hour-a-day dependable service everywhere in the world. There are some 400,000 of them now, and, quite understandably, the number is rising fast.



MATHEWS HYDRANTS

Made by **R. D. WOOD** *Company*

PUBLIC LEDGER BUILDING
INDEPENDENCE SQUARE, PHILADELPHIA 5, PA.

MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

CUT THE COST OF BELL AND SPIGOT WATER MAIN JOINTING

Engineer . . .

This simple, easily applied rubber device

• Speeds sterilization • Saves repeated hypochlorite flushing • Cuts down water waste • Facilitates repairs by giving dry joints • Works with *Tegul*-MINERALEAD, Portland Cement or lead • Easily caulked into place on either

BEADED End Pipe *STRAIGHT End Pipe*

Laborer . . .

Tegul-MINERALEAD

HAVE YOU LOOKED INTO

The INGOT FORM Jointing Compound

Tegul-MINERALEAD has a plastic sulphur base. Initial leakage seals in much less time than usually required.

Makes permanently tight joints with much higher resistance to mechanical and thermal shock.

May be stored in the open without protection from weather.

Cannot change physical composition in transit from plant to job.

Easily mailed, handled, stored and shipped.

Melts fast. Pours easily. Needs no skilled labor or deep bell holes.

Effects worthwhile economies in laying and maintenance.

Write for further information about the HYDE-RO RING *and Tegul*-MINERALEAD

THE *Atlas Mineral*

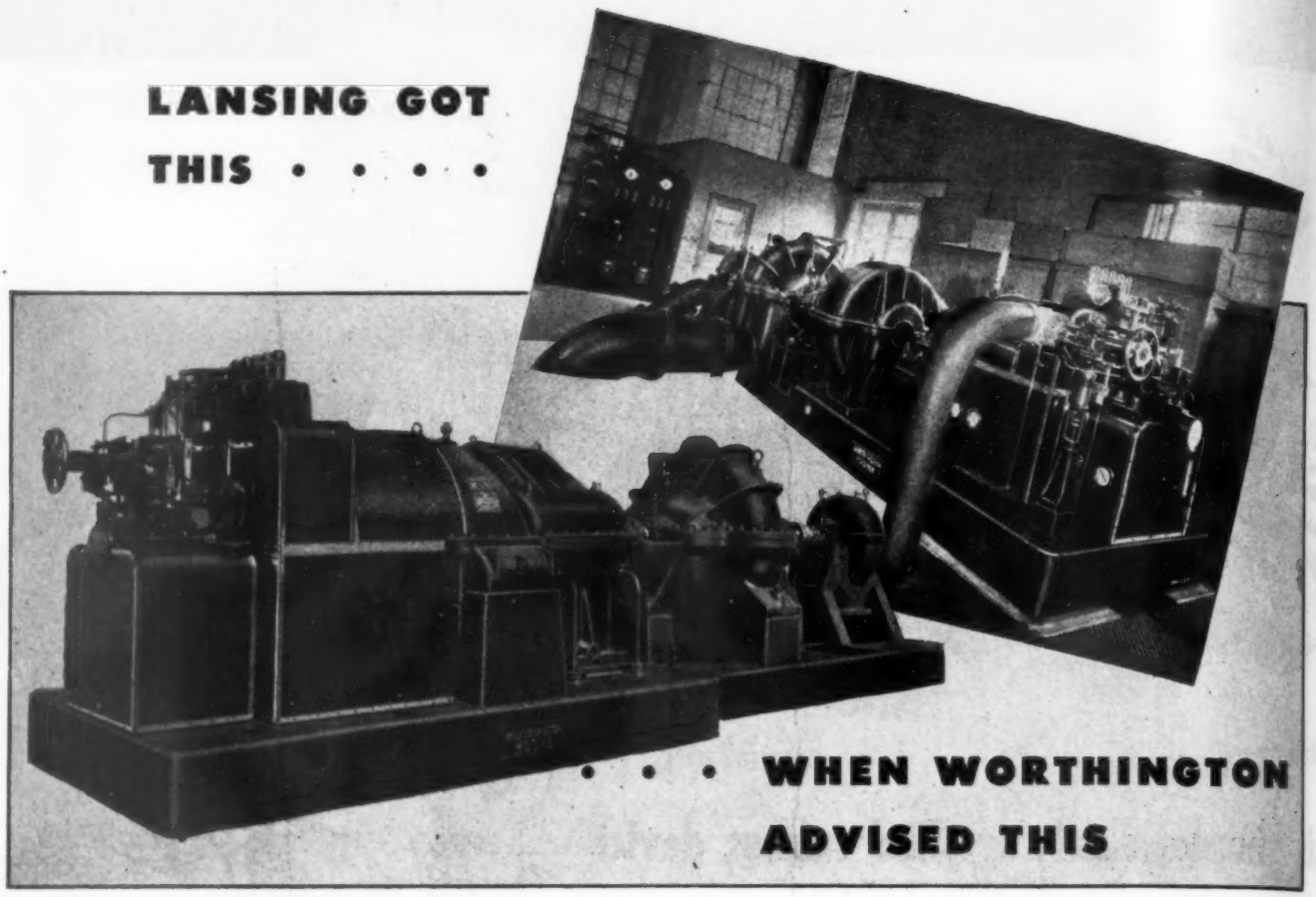
PRODUCTS COMPANY OF PENNA.
MERTZTOWN PENNSYLVANIA

*ATLANTA 3, Ga., 161 Spring St., N.W.
*CHICAGO 1, Ill., 333 No. Michigan Ave. *KANSAS CITY 2, Kan., 1913 Tauromee Ave.
*DALLAS 5, Tex., 3921 Purdue St. NEW YORK 16, N. Y., 280 Madison Ave.
*DETROIT 2, Mich., 2970 W. Grand Blvd. PITTSBURGH 10, Pa., 4656 Old Boston Rd.
ST. LOUIS 1, Mo., 318 North 8 St.

THE ATLAS MINERAL PRODUCTS COMPANY OF CALIFORNIA, Redwood City, California

*DENVER 2, Col., 1921 Blake St. *LOS ANGELES 12, Cal., 817 Yale St.
*HONOLULU 2, Hawaii, U. S. A. *SEATTLE 4, Wash., 2726 First Ave., South
*SALT LAKE CITY 11, Utah, 1212 So. State St.
*Stocks carried at these points

LANSING GOT THIS • • • •



• • • WHEN WORTHINGTON ADVISED THIS

The Result: Tops in Operating Efficiency and Economy

In 1941, the City of Lansing, Michigan installed this Worthington 20″ x 24″ — LC-3 volute centrifugal pump driven by a Worthington 5000 rpm Steam Turbine. The pump is rated at 10 to 20 MGD against 150 to 200 ft. head. After four years of service, it still rates tops with the City of Lansing, on the basis of operating efficiency and economy.

It's not surprising that it should. Laboratory tests, initiated by Worthington in 1918 on actual pump models, are backed by installation and field testing under supervision of a trained Worthington field engineer — a sure guarantee of efficient performance. You know you're on safe ground when Worthington *wins* the bid.

ADVANTAGES OF WORTHINGTON'S *COMPLETE* LINE

Another reason why more jobs go to Worthington is demonstrated in the Lansing installation . . . *completeness of line*. All of the elements making up this Worthington steam turbine driven, condensing, centrifugal waterworks pumping unit are manufactured by Worthington . . . pump, geared turbine, condenser and auxiliaries providing *undivided responsibility*. That one reason is why Worthington is first choice for so many municipal waterworks.

For specific information on Worthington LC-3 Centrifugal Pumps as installed in the City of Lansing, write for Bulletin W-312-B9A. It proves that *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Harrison, N. J.*

MORE JOBS GO TO WORTHINGTON

The complete line . . . the top engineering

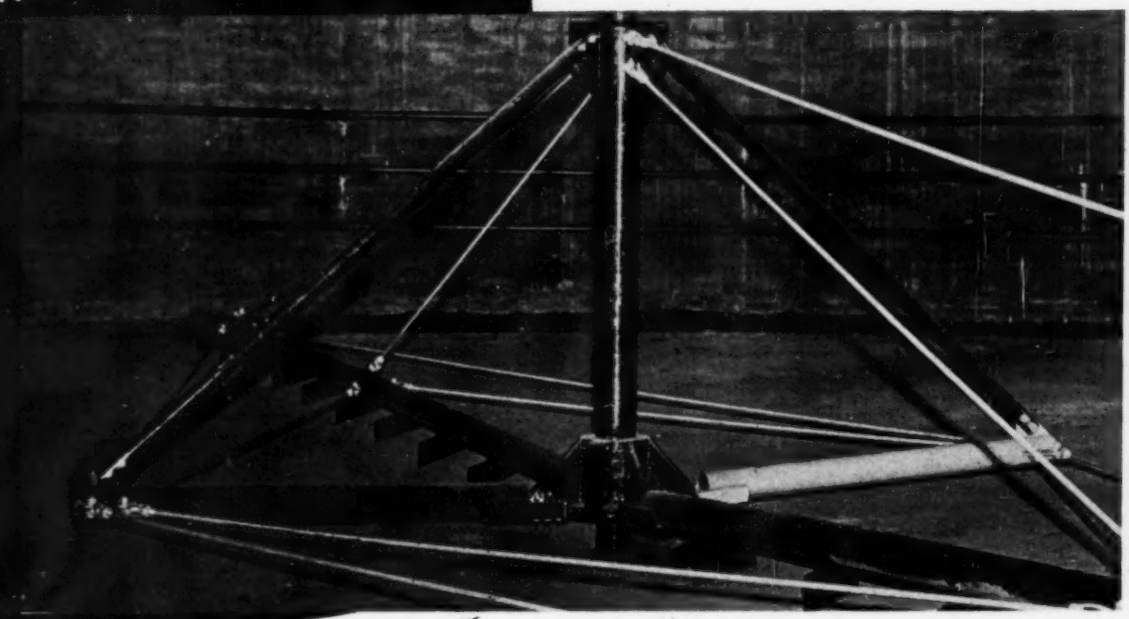
Centrifugal Pumps
Diesel & Gas & Sewage Engines
Dual-Fuel Engines
Turbines & Turbine-Generators
Gas Engine-Compressors
Stationary Compressors
Water Softening, Filtering Equipment
Vertical Turbine Pumps
Water Meters
Power Transmission Equipment
Portable Compressors & Air Tools

WORTHINGTON

24W5-5

When the STIRRING MECHANISM stirs up trouble...

MAINTENANCE TIPS FOR CORROSIVE SEWAGE SERVICES



use BYERS WROUGHT IRON

Most sewage treatment plants are due for extensive overhaul, and if you find the stirring mechanism in your sludge digestion tanks in need of extensive repair or replacement, wrought iron should help you to get longer life in the future.

The illustration shows a mechanism built of Byers Wrought Iron bars, plates and angles, that replaced one made from low-first-cost materials. The wrought iron installation had given three times the service at last report, and there was nothing to indicate that the end of its useful life was anywhere in sight.

It is not surprising that wrought iron should serve so well in this application, as it is almost universally used by designers and operating men for heating coils in digestion tanks. These coils are exposed to the same fluids and the corrosive attack is even more severe, because of the higher coil temperatures.

There is no secret as to why wrought iron gives better service in treatment plants. The structure and composition of the metal are responsible. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity metal, act like baffles, diffusing corrosive attack and discouraging the pitting that causes ordinary materials to fail prematurely. The fibers also anchor the initial protective scale, which shields the underlying metal. The structure and composition of wrought iron are not duplicated by any other material.

Byers Wrought Iron, both tubular and hot rolled, is available right now in any quantity, and for any project. You will find some helpful information on the many places where wrought iron is serving in treatment plants in our technical bulletin, "Wrought Iron for Sewage Treatment and Disposal Installations." We will be happy to send you a complimentary copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

Can your sewerage system help wipe out "polio"?

THE PRECISE cause of poliomyelitis—infantile paralysis—is still a mystery.

One modern theory is that the virus may be spread by the common housefly—the fly that can breed and feed in garbage cans.

If so, modern municipal sanitation experts—who have played so great a part in raising American standards of health and comfort—can go a long way to wipe out "polio" for good and all.

For it is within your power to eliminate the garbage can forever in your community.

And whether or not poliomyelitis is carried by the housefly, there is no doubt that the garbage can is both a nuisance and an evil. It keeps highly putrefactive organic material too near to where people live. It produces unwholesome odors. It helps to breed insects and to feed dangerous rodents.

It is our sincere belief that in the coming era the garbage can will disappear—just as the old-fashioned outhouse disappeared. Advanced sewerage practices removed the one, and they can remove the other—*without affecting any present sewage-works practices.*

Through the *Disposall*—a device that converts fresh food waste into sewage, and flushes it down the drain—food waste can now be borne, removed, treated, and disposed of, precisely like any other sewage solids. There is no longer any need for separate collection of "garbage."

This extension of the sewerage system's utility has been made *possible* by the Disposall. It can be made *inevitable* by your support and enthusiasm—which we earnestly solicit and believe we shall secure.

For your profession has always marched in the vanguard of human progress. You have contributed mightily to civilization in the past, and your contributions are needed for the future.

And we sincerely believe that the Disposall will help in your all-important job of making *your* community a better place to live in!

QUESTIONS AND ANSWERS ABOUT THE NEXT ACHIEVEMENT IN MUNICIPAL SANITATION

1. Why should food wastes be flushed down the drain?

Answer: Why shouldn't they? Probably the same question was asked about human wastes, a century or so ago. Sewers were originally perfected by the Romans for drainage only. About a hundred years ago, they began to be used for removal of human wastes. Food wastes, allowed to putrefy into "garbage," are almost equally unpleasant and dangerous. Their instantaneous removal by water-borne methods is desirable and practical.

2. Won't this mean new problems in sewerage systems?

Answer: No. Ten years of tests have amply substantiated that the ground solids produced by the Disposall are in no significant way different from the solids you are already removing and treating. Both types of material settle, digest, and react identically. Disposall-ground solids will not shoal or settle in lines.

3. How does the Disposall operate?

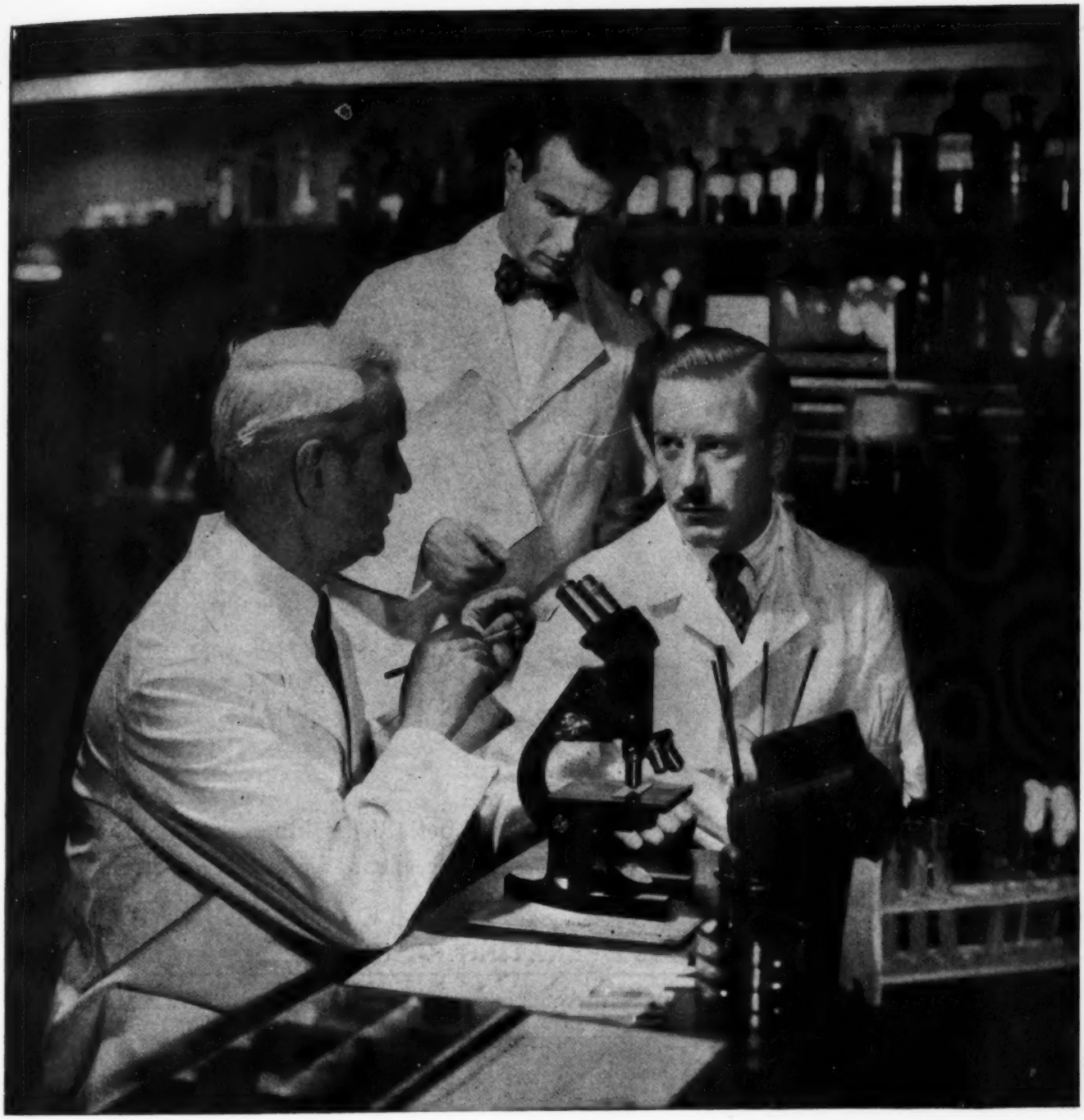
Answer: Motor-driven "*shredders*" in the Disposall macerate food wastes to a size capable of passing through a fine-mesh screen. The Disposall is connected to the sewer line. Water from the sink faucet flushes the ground solids down the drain.

4. Won't this mean an extra burden on our facilities?

Answer: If *every* home in your community installed a Disposall, increase in the volume of your sewage flow would be about *1%*. Even this small increase will be slow and gradual in coming: spread out, probably, over many years. Water consumed is about one gallon per person per day.

5. Why hasn't this been done before?

Answer: Feasability of the Disposall idea has largely come about because *you* made it possible. Recent devel-



opments in sewage treatment practices—for which you and other members of your profession have worked and fought—have made the *combined* disposal of food and human wastes practical. This combined disposal is one more important advance in human welfare with which you, as an authority in municipal sanitation, are identified.

6. Is more information available?

Answer: Indeed it is! Complete data on this coming step in sanitation, and proof that it will let you extend the scope of your service without adding new problems to your work, are available on request. We shall be glad, too, to answer any specific questions you may have. Please write to Department W. W. S. 1125, General Electric, Bridgeport, Conn.

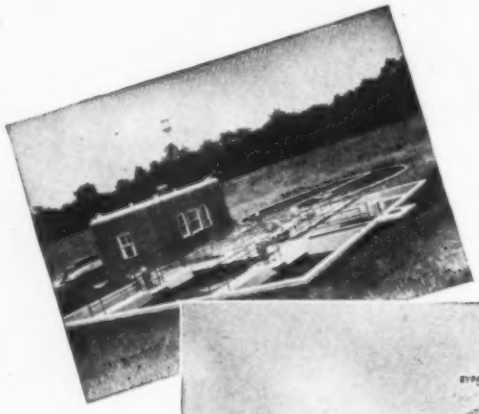
GE Disposall
REG. U. S. PAT. OFF.

CONVERTS FOOD WASTE INTO SEWAGE—ELIMINATES "GARBAGE"

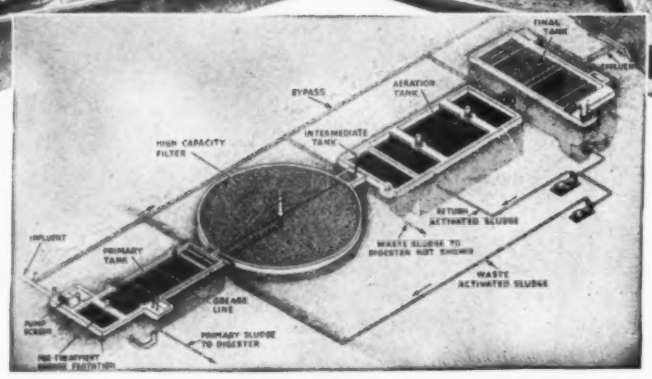
GENERAL ELECTRIC

American Bio-Actuation

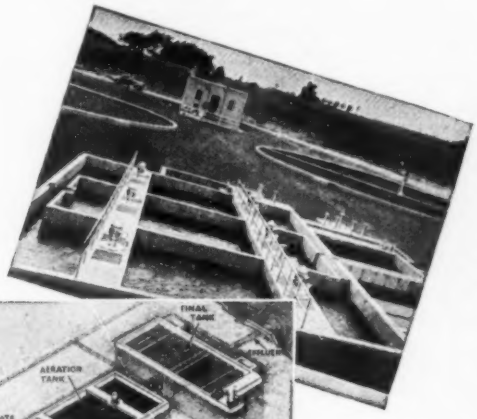
WASTE TREATMENT



COVINGTON
OHIO



FLOW SHEET



CHILTON
WISCONSIN

Bio-Activation combines the best qualities of both the trickling filter and the activated sludge process to produce a completely stable, nitrified effluent, low in B. O. D. and suspended solids.

TYPICAL OPERATING RESULTS

	Domestic, Malt, Brewery and Canning Wastes	
	5 BOD	Suspended Solids
Raw Waste	342	370
Primary Effluent	235*	134
Influent to Filter	510†	.....
Filter Effluent	99	143
Intermediate Effluent	58	65
% Reduction Filter Influent through Intermediate Effluent	89.5	.....
Final Effluent	13	15
% Overall Removal	97.5	96

*High Soluble 5 BOD from malt and brewery.
†Pea waste; 600-1200 ppm. 5 BOD, added in primary effluent.

Blue Print Now! — Send for Bulletin No. 259

THE AMERICAN WELL WORKS

Manufacturers of

PUMPING · SEWAGE TREATMENT · WATER PURIFICATION EQUIPMENT ·

RESEARCH · ENGINEERS · MANUFACTURERS · Factory and Laboratories · · · AURORA, ILLINOIS

Commonplace Essentials loom large among materials on which many modern advances in chemical synthesis depend. Caustic soda, one of the most familiar faces in the chemical family, is typical. For "NaOH" serves in the processing of rayon yarns for fine fabrics, soaps, refined petroleum and vegetable oils, paper making, and in rubber reclamation. Thorough knowledge of such widely used "Commonplace Essentials"... is combined with Niagara's recognized preeminent standards of manufacture to provide users with the dependable source of supply they need.

An Essential Part of America's Great Chemical Enterprise

Niagara Alkali Company

CAUSTIC POTASH • CAUSTIC SODA • PARADICHLOROBENZENE • CARBONATE OF POTASH • LIQUID CHLORINE • NIATHAL

60 EAST 42nd STREET • NEW YORK 17, N. Y.

PITTCHLOR

The Easy Way to Put CHLORINE to Work

Yes, PITTCHLOR provides an exceptionally easy way to put Chlorine to work. *Contains a minimum of 70% available Chlorine.* Granular in form, PITTCHLOR is dry and practically dustless . . . non-caking and free-flowing . . . dissolves readily in water to make solutions of the strength needed for the job you want Chlorine to do.

You can make supply solutions easily and quickly for use as required. You'll find the 5 pound resealable cans or 3¼ pound cans convenient to use—they're readily identified by their distinctive red, white and blue designs. Also packed in 100 pound drums. PITTCHLOR is distributed through leading jobbers.

AS A BLEACH—GERMICIDE—DISINFECTANT

PITTCHLOR is the convenient, economical way to employ Chlorine.

Laundries use it for its quick, uniform bleaching solutions, its deodorant and positive disinfectant qualities.

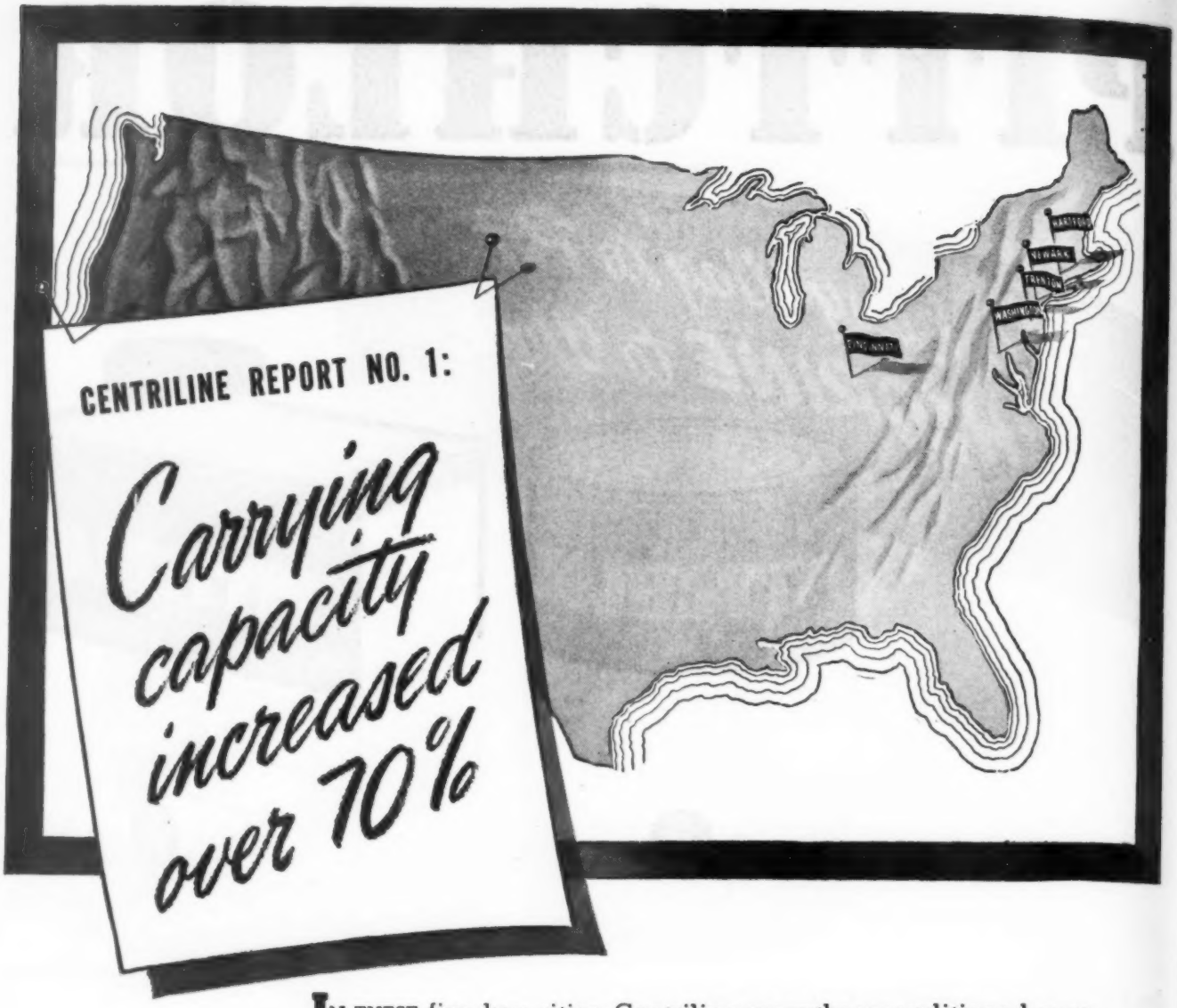
Municipalities use it for easily handled water purification and sewerage treatment, for quick effective sanitation in and around all publicly used areas, such as lavatories, swimming pools, shower baths, etc.

PITTCHLOR is equally effective and convenient for the many other uses where the positive action of Chlorine is desired—as a Bleach, Germicide, Disinfectant, Deodorant.

COLUMBIA CHEMICALS

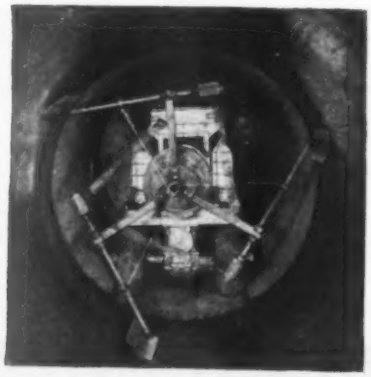
PITTSBURGH PLATE GLASS COMPANY • COLUMBIA CHEMICAL DIVISION
GRANT BUILDING, PITTSBURGH 19, PENNSYLVANIA

Chicago • Boston • St. Louis • Pittsburgh • New York • Cincinnati • Cleveland • Philadelphia • Minneapolis • Charlotte • San Francisco



IN THESE five key cities, Centriline recently reconditioned over a hundred thousand feet of important water supply mains . . . with the result of an average increase of over 70% carrying capacity.

These pipelines . . . ranging in sizes from 36" to 48" and varying in ages from 25 to 51 years . . . were badly crippled and choked because tuberculation and corrosion had taken a strong hold of their hydraulic efficiency. However, Centriline men and equipment went to work and soon had them in smooth-running condition.



The Centriline process is a rapid and economical method of reconditioning pipelines. It consists of first cleaning the main, then applying by centrifugal force, a dense cement mortar lining of required thickness, mechanically troweled to a smooth finish. This is done underground, in place.

Don't wait for tests to show a decrease in carrying capacity and your budget to go off balance with costly pumping expenditures—CENTRILINE NOW! Wherever your pipeline is situated, whatever its length—if its diameter is 30" or more—our men can quickly reach and recondition it. We welcome your inquiry.

CENTRILINE PROCESS

CENTRILINE CORPORATION

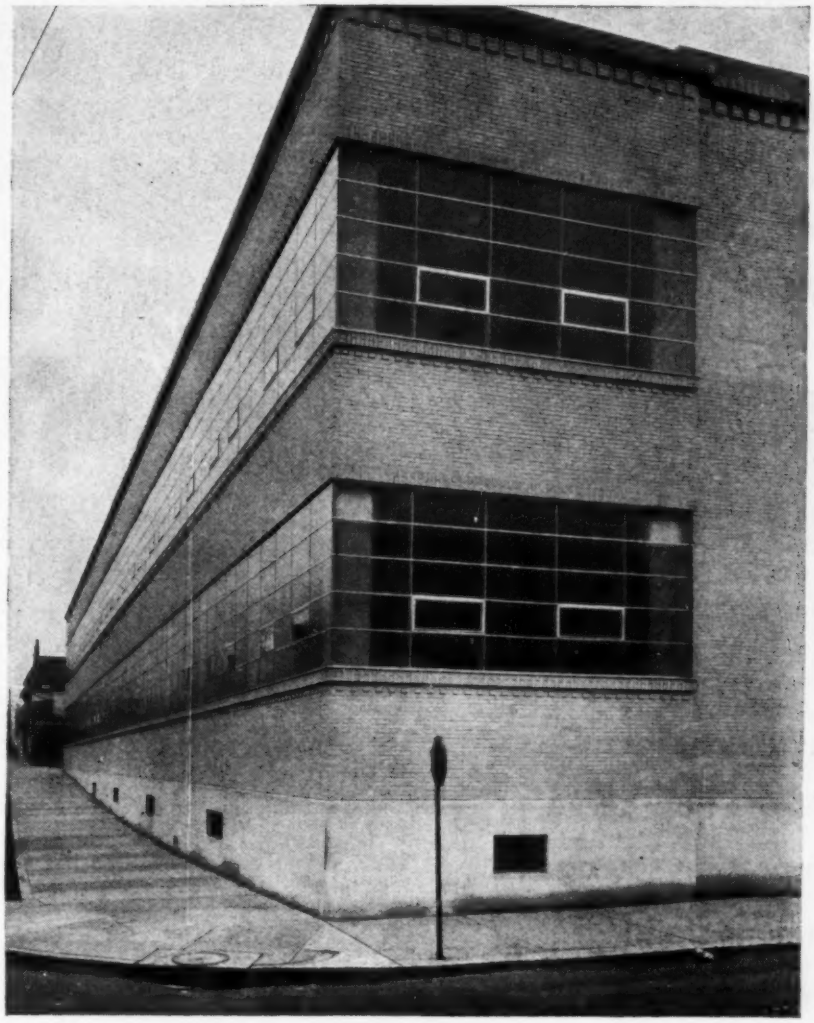
148 CEDAR STREET • NEW YORK 6, N. Y.

Restores and Protects Pipe-Line Carrying Capacity

Good for the Long Run —

GEYSER BAR WINDOWS OF ALCOA ALUMINUM

Note the trim neatness and narrow lines of these all-aluminum Geyser Bar Windows



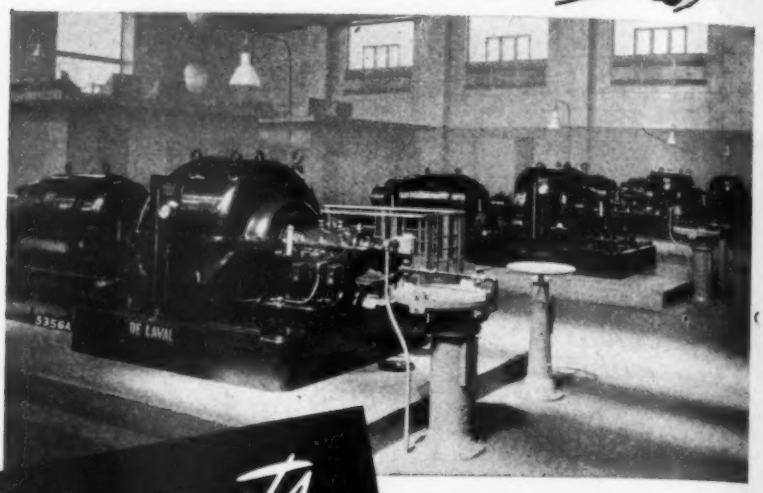
Horizontal members of these very practical windows have the appearance of running continuously from jamb to jamb. Actually, these members are broken only at inconspicuous but effective expansion joints. All members are shop-fabricated to fit wall openings. Assembly is done on the job.

The narrow lines of this window construction disguise the sturdy character of its Alcoa aluminum members. Strong when installed, they stay that way. There's no rusting or rotting to cause deterioration. No need for protective painting.

Years of experience with aluminum windows of various types in industrial plants, office buildings and residences have proved that they are durable and economical. It pays to include windows of Alcoa Aluminum in your plans. ALUMINUM COMPANY OF AMERICA, 1955 Gulf Bldg., Pittsburgh 19, Pa.

Windows of **ALCOA ALUMINUM**

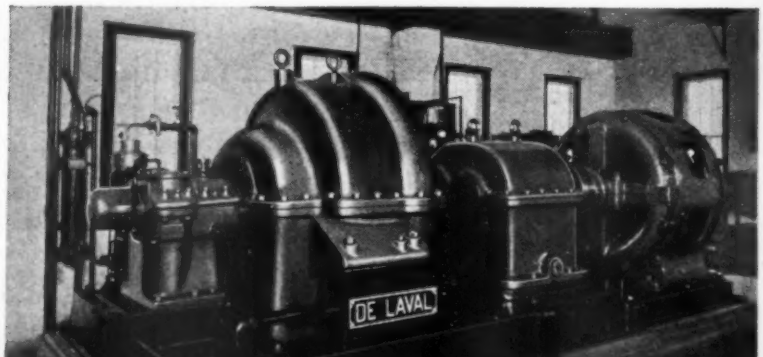
Bowery Bay (City of New York). Four De Laval 10,000 c.f.m., 7 psi compressors driven by 500 hp., 3600 rpm, wound rotor motors.

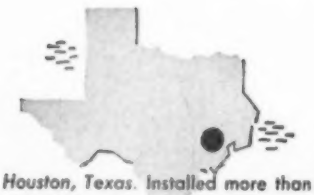


Consult DE LAVAL about your Compressor Requirements

De Laval centrifugal compressors now serve many important sewage treatment stations efficiently

Cleveland, Ohio. De Laval compressors employed for activated sludge treatment at the Easterly Sewage Plant.





Houston, Texas. Installed more than 17 years ago in the City of Houston Sewage Treatment Plant, this compressor has given practically continuous service without ever requiring repairs or replacements.

3832

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

DE LAVAL

STEAM TURBINE COMPANY · TRENTON 2, NEW JERSEY

SALES OFFICES: ATLANTA • BOSTON • CHARLOTTE • CHICAGO • CLEVELAND • DENVER DETROIT • DULUTH • EDMONTON • GREAT FALLS • HAVANA • HELENA • HOUSTON KANSAS CITY • LOS ANGELES • MONTREAL NEW ORLEANS • NEW YORK • PHILADELPHIA PITTSBURGH • ROCHESTER • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE TORONTO • TULSA • VANCOUVER • WASHINGTON, D. C. • WINNIPEG

NATURE'S PERFECT DRINKING WATER . . . RIGHT IN YOUR HOME

Almost a year ago Mathieson advertisements told you of the development of the Chlorine Dioxide technique for treating public water supplies to overcome taste and odor problems.

Now—to bring you up to date and inform you how soon communities with such problems may hope to enjoy the really fine drinking water this process produces.

Mathieson has stepped up production of Sodium Chlorite (from which Chlorine Dioxide is generated) to much higher levels than was thought possible even a year ago. Availability of the chemical, however, is not the sole factor. Each water supply must be thoroughly analyzed before recommendations can be made *for no two sets of conditions are alike.*

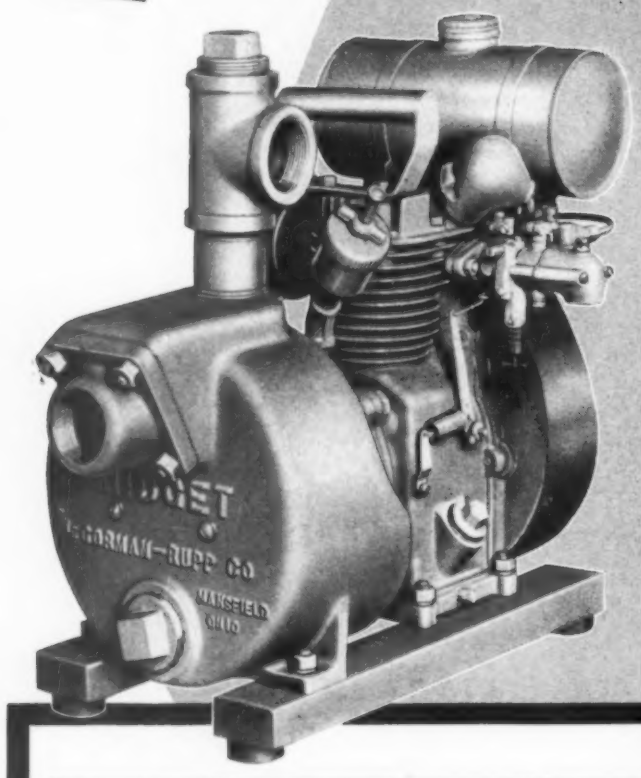
It is of greatest importance to Mathieson that each community which will use the Chlorine Dioxide technique be as enthusiastic as are those where the technique is already producing such highly satisfactory results . . . and our field staff has been augmented by men with water works experience who are being specially trained in Chlorine Dioxide technique. *Chlorine Dioxide is worth waiting for!*

Mathieson
CHEMICALS

Sodium Chlorite . . . Chlorine Dioxide . . . HTH Products . . . Liquid Chlorine . . . Sodium Methylate . . . Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Fused Alkali Products . . . Ammonia, Anhydrous & Aqua . . . Synthetic Salt Cake . . . Dry Ice . . . Carbonic Gas

THE MATHIESON ALKALI WORKS (INC.) 60 EAST 42nd STREET, NEW YORK 17, N. Y.

PUMPS SIX TIMES ITS WEIGHT IN WATER EVERY MINUTE



Smallest of more than 50 models of Gorman-Rupp centrifugal pumps, the Midget can do hundreds of handy pumping jobs. Here's why:

(1) Small, compact, weighs 60 pounds complete, can be carried to jobs on track speeder and easily handled by one man.

(2) Automatic self-primed. When the engine starts, the water starts. No valves to tinker with; no by-passes to rob efficiency.

(3) Handles any consistency of muck or any size solid matter that will pass intake strainer. Streamlined interior can't clog.

(4) Pumps more per gallon of fuel —more per pound of pump— more for its size—than any other pump on the market.

Study this table of facts on the Gorman-Rupp Midget and a few other typical larger models and see where they will fit into your various water-handling problems.

Capacity in Gals. per Hour with pump 15 ft. above water	TOTAL HEAD (incl. friction)			
	30 ft.	40 ft.	50 ft.	60 ft.
MIDGET (60 lbs.)	3180	2880	2160	1500
EAGLE (120 lbs.)	10200	8400	6300	2700
MODEL 40-M (1080 lbs.)	34500	33900	32700	30600
MODEL 90-M (1600 lbs.)	76800	73800	69600	63000

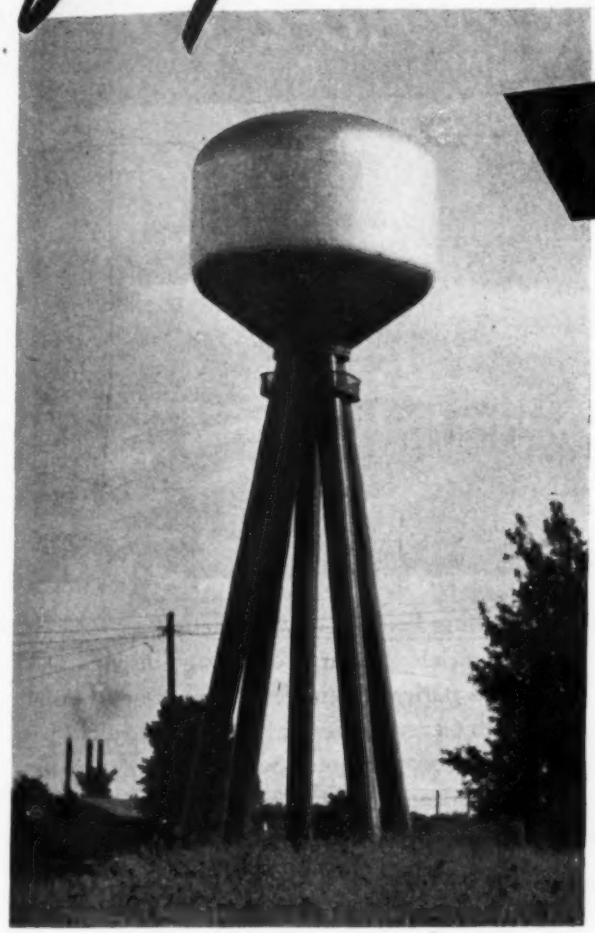
GORMAN-RUPP PUMPS — ARMY NAVY — UNSURPASSED FOR PUMPING FAST

THE GORMAN-RUPP COMPANY

MANSFIELD, OHIO

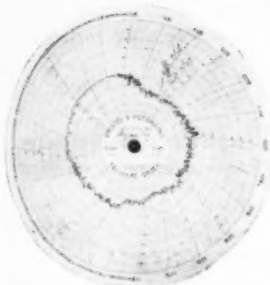
Improving WATER DISTRIBUTION AND PRESSURE

with Horton Elevated Water Storage

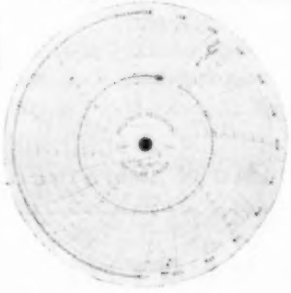


The Northern Indiana Public Service Company recently installed two Horton elevated water storage tanks to improve the pressure in the distribution systems serving Warsaw and Winona Lake, Indiana. The two systems are substantially one and the need for two elevated water storage tanks is due partially to the difference in elevation in the section served but principally to the fact that the two areas of concentrated population are separated by an area having a relatively light population. The water for both cities is pumped from a lake near the center of Warsaw to a main purification and pumping station where it is aerated, mixed with chemicals and chlorine, settled, filtered and post-chlorinated.

The "before" and "after" charts reproduced here were recorded at the end of the distribution system. They show how the Horton elevated tanks have helped to improve the water pressure in the mains.



Left: Chart showing pressure in the mains before the Horton elevated water storage tanks were erected.



Right: Chart showing pressure in the mains after Horton elevated tanks were installed.

The 250,000-gal. Horton conispherical-bottom elevated tank shown above is located at Warsaw, Indiana. It is 85 ft. to bottom. Another Horton elevated tank of similar design, with a capacity of 150,000 gals. and 75 ft. to bottom, is located at Winona Lake, Indiana.

We invite you to write our nearest office for quotations on all types of elevated water storage tanks or steel reservoirs. There is no obligation.

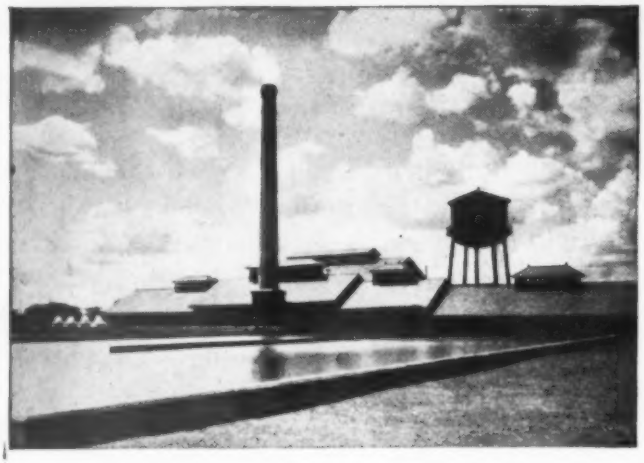
CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Los Angeles 14.....1455 Wm. Fox Bldg.
Birmingham 1.....1586 North 50th Street
Atlanta 3.....2181 Healey Bldg.
Plant in Birmingham, Chicago and Greenville, Pa.

Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Drive
Philadelphia 3.....1644-1700 Walnut Street Bldg.
Washington 4.....703 Atlantic Bldg.
San Francisco 11.....1283-22 Battery St. Bldg.
Detroit 26.....1551 Lafayette Bldg.
In Canada: Horton Steel Works, Limited, Fort Erie, Ont.

GENERAL CHEMICAL "ALUM"

. . . EQUALLY EFFICIENT FOR COAGULATION OF *WATER and SEWAGE!*



Today, aluminum sulfate is almost universally accepted by water experts as the best coagulant for the removal of turbidity, color and bacteria from water . . . and General Chemical Aluminum Sulfate is the outstanding choice the nation over. The reason? Operating men have come to rely on its high quality and constant uniformity, knowing that the effectiveness of General Chemical Alum has been "proved in settling basins all over America."

Municipal officials in charge of sewage disposal find that clarity and purity of sewage effluent are also easily obtainable with General Chemical Aluminum Sulfate because of the many reasons noted below. Why not join the majority of American cities that prefer General Chemical Alum—and specify "General" for your requirements?

★ FOR WATER WORKS

1. Produces crystal-clear water.
2. Gives better floc formation resulting in longer filter runs.
3. It is a low-cost coagulant.
4. Has no chlorine demand, conserving chlorine exclusively for disinfection.
5. Superior in tests against other coagulants.
6. High in quality, its constant uniformity can be counted upon.
7. Aids in the reduction of tastes and odors.

★ FOR SEWAGE PLANTS

1. Clean, easy to handle, dry feeds well, and economical to use.
2. Simple application, requires only low cost feeding apparatus and minimum attention.
3. Clear, colorless effluents are possible.
4. Sludge digests readily.
5. Treated digested sludge dries quickly, with a minimum of odor.
6. Chlorine consumption is cut due to lower demand of clarified sewage.

BASIC CHEMICALS

GENERAL CHEMICAL COMPANY

FOR AMERICAN INDUSTRY

"Preferred by Most American Cities"

GENERAL CHEMICAL COMPANY

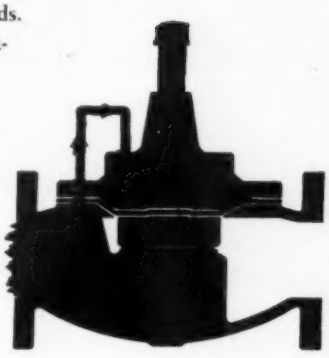
40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston Kansas City • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh Providence (R. I.) • San Francisco • Seattle • St. Louis • Utica (N. Y.) • Wenatchee & Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corporation, Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

CLAYTON Valves open and close by hydraulic forces . . . much more powerful than human hands. Action is automatic and is controlled by float mechanisms, by adjustable counterbalance, by direction of flow or by variations in line pressure . . . the kind of control depending upon the type of Clayton Valve required. Through their exclusive, patented design and construction, they provide many advantages of importance to the Water Works field. These features include quick, easy access to all working parts from the top of the valve. No lubrication is required. No packing is used. Sizes range from ⅜" to 16" for pressures to 300 psi.



THE CLAYTON LINE includes Float Valves, Altitude Valves, Check Valves, Constant Discharge Pressure Regulating Valves, Pump Control Valves, Blackflow Prevention Units.

Write for Engineering Data:

VALVE DIVISION
CLAYTON MANUFACTURING CO.
ALHAMBRA, CALIFORNIA

CLAYTON VALVES
with FEATHER-TOUCH CONTROL

Ready for Any Job

AT ANY TIME

Here's another way that you can use a portable Homelite Gasoline-Engine-Driven Generator. Simply hook up a power wrench to a Homelite and you'll open and close gate valves, quicker and easier than ever before.

Homelite Portable Gasoline-Engine-Driven Generators are "ready for any job, at any time" because they are dependable at all times... ready to start and sure to run without trouble, no matter where you put them or what the working or weather conditions are.

Homelite Corporation

Portable PUMPS · GENERATORS · BLOWERS

PORT CHESTER, NEW YORK

Raw water presents many taste and odor control problems. Customers demand the very best in water; and attainment of this standard is next to impossible without the aid of an efficient adsorbent. Aqua Nuchar Activated Carbon is the answer, for it achieves odorless and tasteless water through *adsorption* of the impurities that cause unpalatability.

Besides being so effective, Aqua Nuchar is inexpensive. In the average community the cost has proven to be less than two cents per capita per year.

Stocks of Aqua Nuchar Activated Carbon are located at strategic points throughout the United States and since you never can tell when taste and odor problems will arise it would be wise to have an adequate supply of Aqua Nuchar on hand.

To assure clear, palatable water for your community, use Aqua Nuchar Activated Carbon. Put *ad*sorption to work for you!

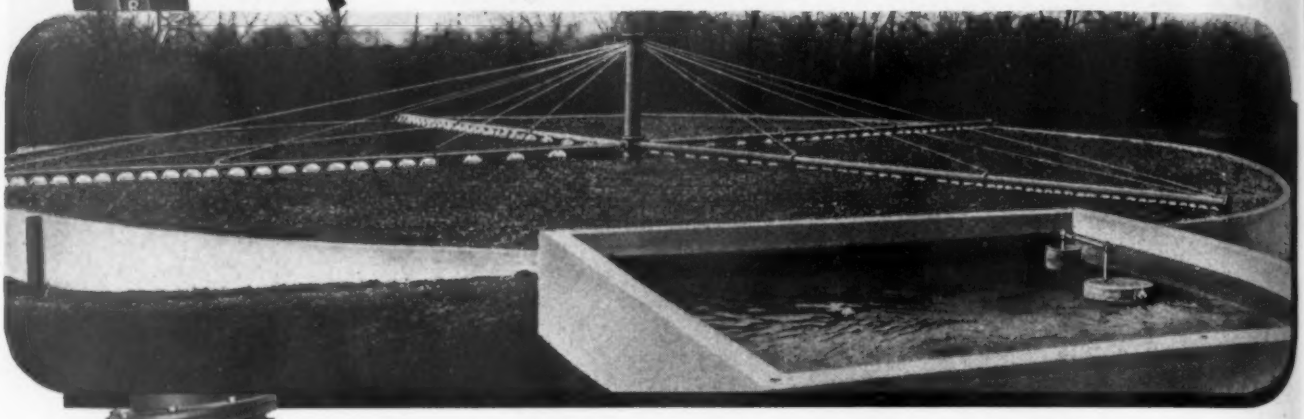
NUCHAR
INSURES PALATABLE DRINKING WATER

INDUSTRIAL CHEMICAL SALES

DIVISION WEST VIRGINIA PULP AND PAPER COMPANY

230 PARK AVENUE, NEW YORK 17, N.Y. — 35 E. WACKER DRIVE, CHICAGO 1, ILLINOIS — 748 PUBLIC LEDGER BLDG., PHILADELPHIA 6, PA. — 844 LEADER BLDG., CLEVELAND 14, OHIO

CARTER REACTION TYPE *Rotary* DISTRIBUTOR



FOR TRICKLING FILTER SYSTEM OF BIOLOGICAL TREATMENT

ADDITIONAL FEATURES

- Oversize ball bearings.
- Adequate lubrication capacity.
- Automatic mercury return.
- Welded construction and standard parts...the better to meet emergency field repairs.
- Extra heavy steel guy rods equipped with turnbuckles for correct arm alignment.
- Automatic alternating siphon—insures correct operation of distributor mechanism.

HERE'S the tried and proven method of treatment that will economically give excellent results with comparatively little attention. Operating data compiled on CARTER normal rate distributors shows:

1. A consistently high removal of B.O.D. and suspended solids.
2. Complete elimination or practical control of filter fly problems.
3. Little or no reduction of efficiency during winter temperatures.

With CARTER units there's no recirculating pumping problems or maintenance; no excessive chlorination or flooding for fly control and . . . no filter clogging.

Mechanically the CARTER distributors top the field. Such features as an improved leveling flange that permits column alignment without disassembly of arms, anti-corrosion-proof bronze nozzles and a mercury chamber designed to adequately seal both columns make our distributor a unit worthy of consideration for your next plant.

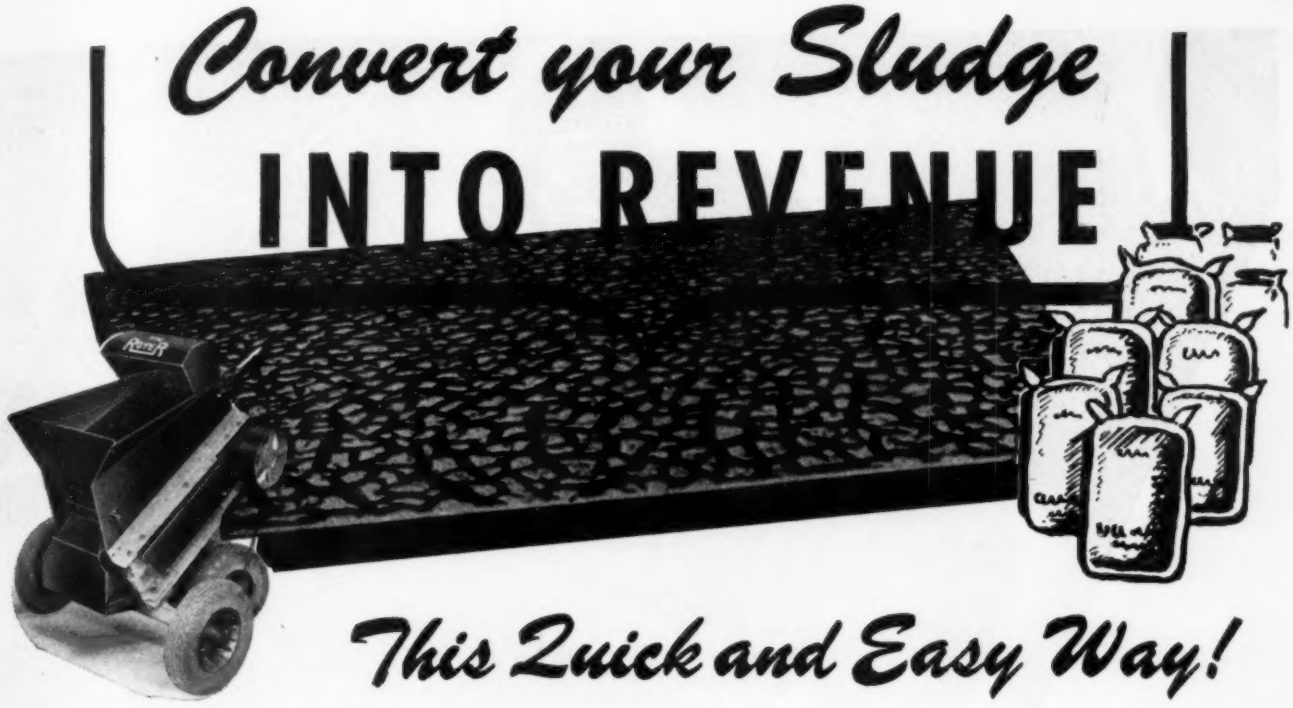
Our engineering and testing facilities are always available for technical assistance to our customers. Complete information on this or other CARTER mechanisms for water purification or sewage treatment will be gladly furnished without obligation.

● *WRITE FOR BULLETIN 4401*

RALPH B. CARTER COMPANY

Main Office: HACKENSACK, N. J. New York Office: 53 PARK PL., NEW YORK 7, N.Y.

Convert your Sludge INTO REVENUE



This Quick and Easy Way!

Burying or incinerating sewage sludge is a prodigal practice; equivalent to wasting food. Your sludge contains high fertilizing values which will increase food crops, and greater food production continues to be a matter of prime importance.

At a cost less than that of burning or burial, you can convert your sludge into a usable fertilizer, which is in demand everywhere among growers of food crops. At the same time you can establish a permanent source of substantial revenue.

A growing host of sewage disposal plants —large and small—are reaping profits from their sludge beds with the Royer Sludge Disintegrator.

Sludge cake from the drying beds is shoveled into the hopper of this rugged, inexpensive machine, which does all the work. The sludge is shredded and reduced to a size that soil will readily assimilate, mixed, aerated and further dried. The Royer discharges onto pile or truck an effective, ready-to-use, easy to sell fertilizer. A high strength fertilizer may be produced in the same operation by the addition of enriching chemicals.

Fertilizer sales soon pay for the Royer, which continues to produce revenue, winter or summer. Available in twelve stationary and portable models, with sizes for every city; electric motor, gasoline engine or belt-to-tractor driven.

Write for "Sewage Sludge Utilization Catalog" which contains comprehensive information on the use of sludge as a fertilizer and shows all Royer models.

Royer Model "NSH" Sludge Disintegrator at Buffalo, N. Y.

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA.

Standard gate valves can be inserted in any line up to 48″ in size, without interrupting the flow. The procedure is simple, fast and practical. The nuisance of shutting down the line and the expense of dewatering is entirely eliminated.

SMITH Valve Inserting Machines can be purchased or rented. Write for information.

FIRE HYDRANTS
GATE VALVES
CHECK VALVES
INSERTING VALVES
TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

FLOOR STANDS
INDICATOR POSTS
TAPPING MACHINES
INSERTING MACHINES
PIPE CUTTING MACHINES
CORPORATION TAPPING MACHINES

"We can't get along

without

CALGON*"

We believe that we did a pretty good job of keeping our customers supplied with Calgon during the war, in spite of the fact that government requirements came first.

Nevertheless a shipment to one water system went astray, apparently side-tracked for war freight—and we heard from the customer in a hurry.

"It is imperative," their purchasing agent wrote us, "that we have a supply of Calgon on hand at all times. We were out for three weeks on one occasion, and as a result received numerous complaints which would otherwise have been unnecessary."

In hundreds of communities, Calgon is used in water supply systems to prevent scale, inhibit corrosion, and prevent the precipitation of dissolved iron—all at extremely low cost.

Make threshold treatment with Calgon a part of *your* public relations program. Let us send you full information.

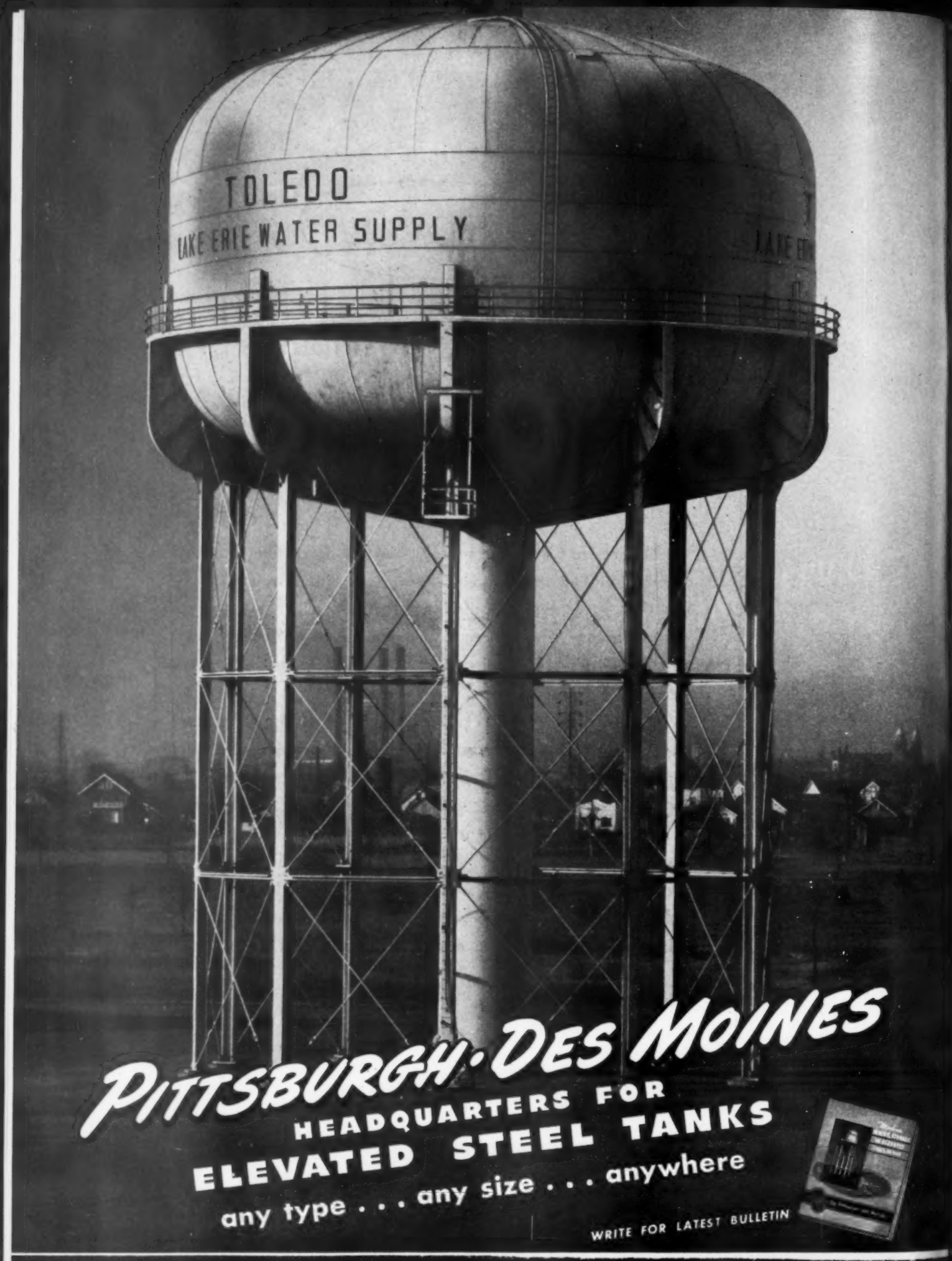
*Calgon is the registered trade-mark of Calgon, Inc., for its glassy sodium phosphate products.

HAGAN
HALL
BUROMIN
CALGON

calgon, inc.

A SUBSIDIARY OF
HAGAN CORPORATION

HAGAN BUILDING
PITTSBURGH 30, PA.



PITTSBURGH·DES MOINES

HEADQUARTERS FOR

ELEVATED STEEL TANKS

any type . . . any size . . . anywhere

WRITE FOR LATEST BULLETIN

PITTSBURGH·DES MOINES STEEL CO.

PITTSBURGH, PA., 3414 NEVILLE ISLAND—DES MOINES, IOWA, 915 TUTTLE STREET

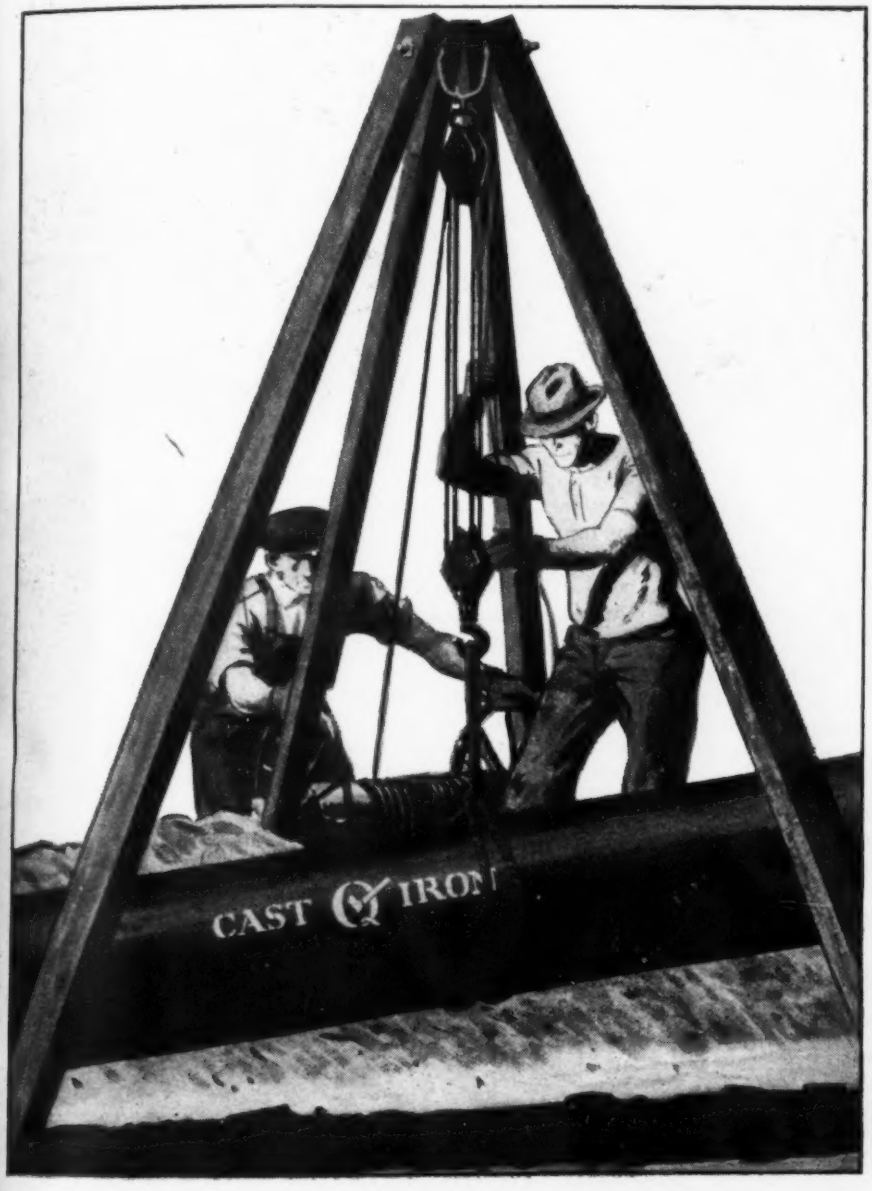
NEW YORK, ROOM 921, 216 BROADWAY · CHICAGO, 1218 FIRST NATIONAL BANK BUILDING

DALLAS, 1219 PRAETORIAN BUILDING · SAN FRANCISCO, 621 RIALTO BUILDING

SEATTLE, 522 EIGHTH AVENUE, SOUTH

Not for a decade, not for a generation, but for a *century* or more, cast iron pipe serves faithfully and economically in water, gas and sewerage systems. Its known useful life is more than double the estimated life of other pipe used for underground mains. Replacements sooner or later required when shorter-lived pipe is installed are avoided by the use of cast iron pipe, thus saving many millions of tax dollars. That is why cast iron pipe is so often referred to as Public Tax Saver No. 1.

Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, Peoples Gas Building, Chicago 3, Illinois.



CAST IRON

CAST IRON PIPE

SERVES FOR CENTURIES

Cuts Sewage Carrying Costs— ALL ALONG THE LINE!

LOWER handling costs . . . faster assembly . . . less infiltration . . . high carrying capacity . . . these are some of the ways Transite Sewer Pipe provides important economies *all along the line*—in handling, installation and performance!

And here are the reasons why:

Long lengths, light weight. Transite Sewer Pipe is made in long 13-foot lengths. That means fewer joints . . . more footage per day. Its light weight also speeds up installation, reduces handling costs.

Tight sleeve-type joints. To guard against costly infiltration and keep down the load at the disposal plant, Transite has a sleeve-type joint combining flexibility with tightness. Easily assembled, *stays* tight in service.

Smooth interior surface. An advantage that assures high carrying capacity (Kutter's n=0.010). This frequently permits the use of smaller pipe, or flatter grades with shallower trenches.

An asbestos-cement product. Made of asbestos and cement compressed into a tough, dense, homogeneous structure, Transite Sewer Pipe is strong, durable and highly resistant to destructive agencies underground. Its efficiency and economy has been proved through the years under a wide range of service conditions.

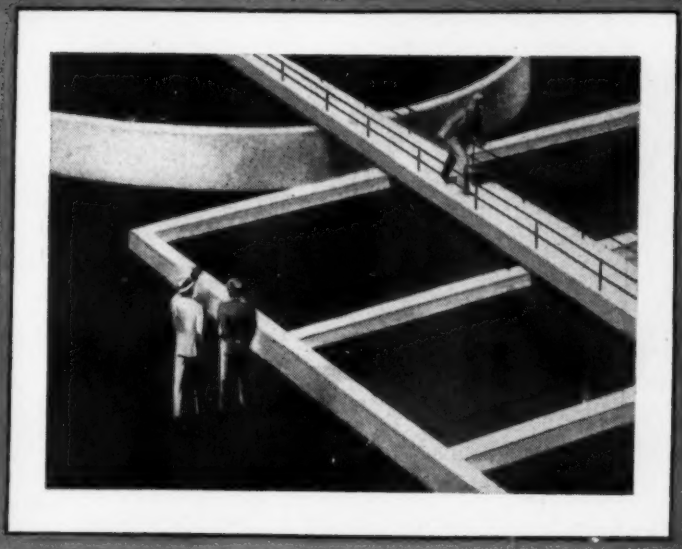
If your plans include sewage works improvements, write for Brochure TR-21A which gives the facts about Transite Sewer Pipe. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

JM PRODUCTS

Johns-Manville TRANSITE *Sewer* PIPE

FOR EFFICIENT, ECONOMICAL SEWAGE DISPOSAL

DIAMOND LIQUID CHLORINE



The standard, modern and most effective method of treating sewage. Available in single unit cars, multi-unit tank cars and cylinders to meet your specific needs.

Diamond Alkali Co. Pittsburgh, Pa., and Everywhere

ALKALI

Lithographed on stone by Edward A. Wilson

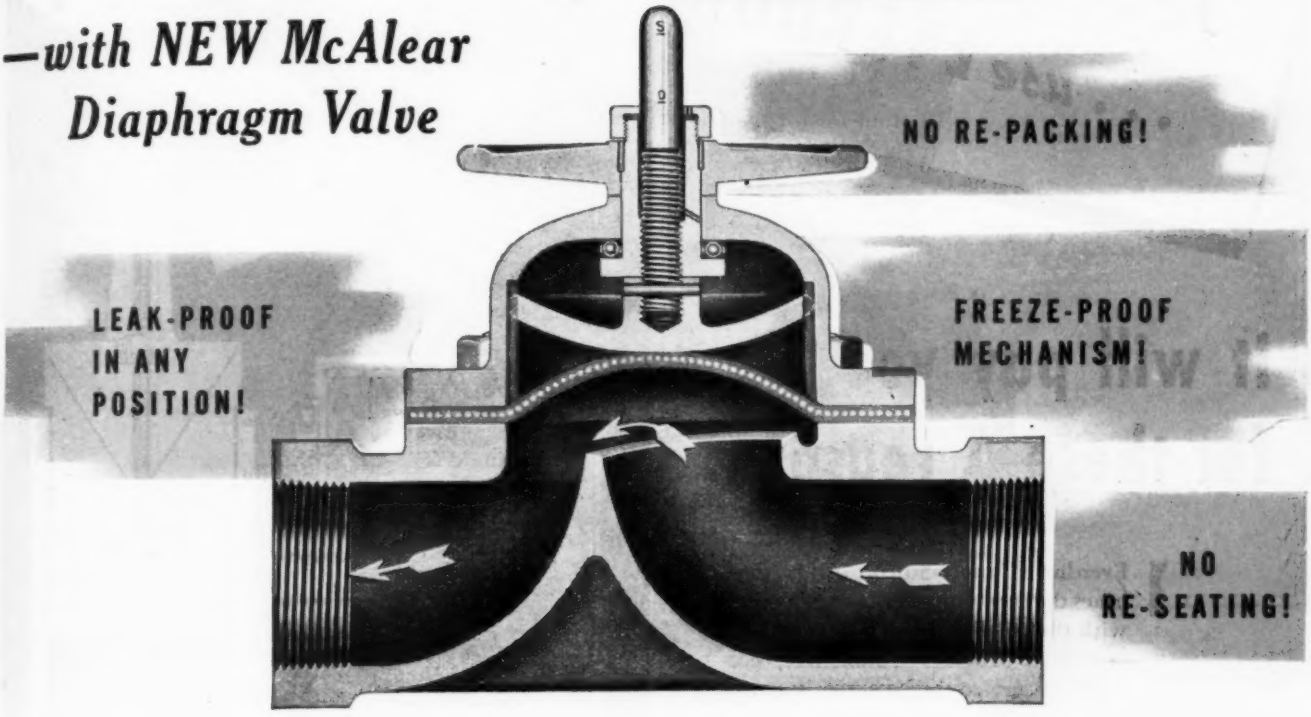
Illustration shows installation of cast iron flexible joint subaqueous pipe line specified for the required service conditions. How to do it when you get the go-ahead is a problem we are always glad to help out on if it involves pipe design, or recommendations as to pipe and fittings which have successfully met similar problems. To see that our product is correctly specified for the purpose intended is an important function of our sales engineering and technical staffs. Forty-five years' experience as largest producers of cast iron pipe is behind them and always at your service.

U.S.
cast iron
PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout the U. S. A.

HANDLE CORROSIVES and ABRASIVES SAFELY...

—with NEW McAlear Diaphragm Valve



McAlear No. M-1455 DIAPHRAGM VALVE

PRESSURES to 150 lbs. **TEMPERATURES** to 150° F. **SIZES** ½" to 6"

NO. M-1455 DIAPHRAGM VALVE replaces gate and other expensive types of valves in:

- ★ REFINERIES
- ★ CHEMICAL PLANTS
- ★ PROCESSING PLANTS
- ★ FOOD PLANTS
- ★ WATER WORKS
- ★ SEWAGE PLANTS
- ★ STEAM POWER PLANTS
- ★ SALT WATER SERVICE
- ★ PAINT FACTORIES
- ★ PAPER MILLS, etc.

IN ALL INDUSTRIES that cope with hard-to-handle liquids, this valve —which has proved *practically indestructible* in service with upwards of 100 acids, alkalies and suspended solids—has won enthusiastic approval.

Its simple mechanism (2 moving parts in the hand-wheel type, 1 in pilot type) cannot "freeze"—because diaphragm separates it completely from liquids handled. Diaphragm gives *positive shut-off* even when solids are trapped on seat. Valve does *not* depend on metal-to-metal contact for closure, hence *cannot leak,* never requires re-seating, and can be installed in *any* position. The only replacement part (the diaphragm) can be replaced without removing valve from line.

Special types may be operated from remote points by air or water pressure, controlled by automatic time-clock or pilot. For bulletin giving complete data, write McAlear Manufacturing Co., Automatic Control Division of Climax Industries, 41 N. Cincinnati Street, Tulsa, Okla.

CLIMAX INDUSTRIES

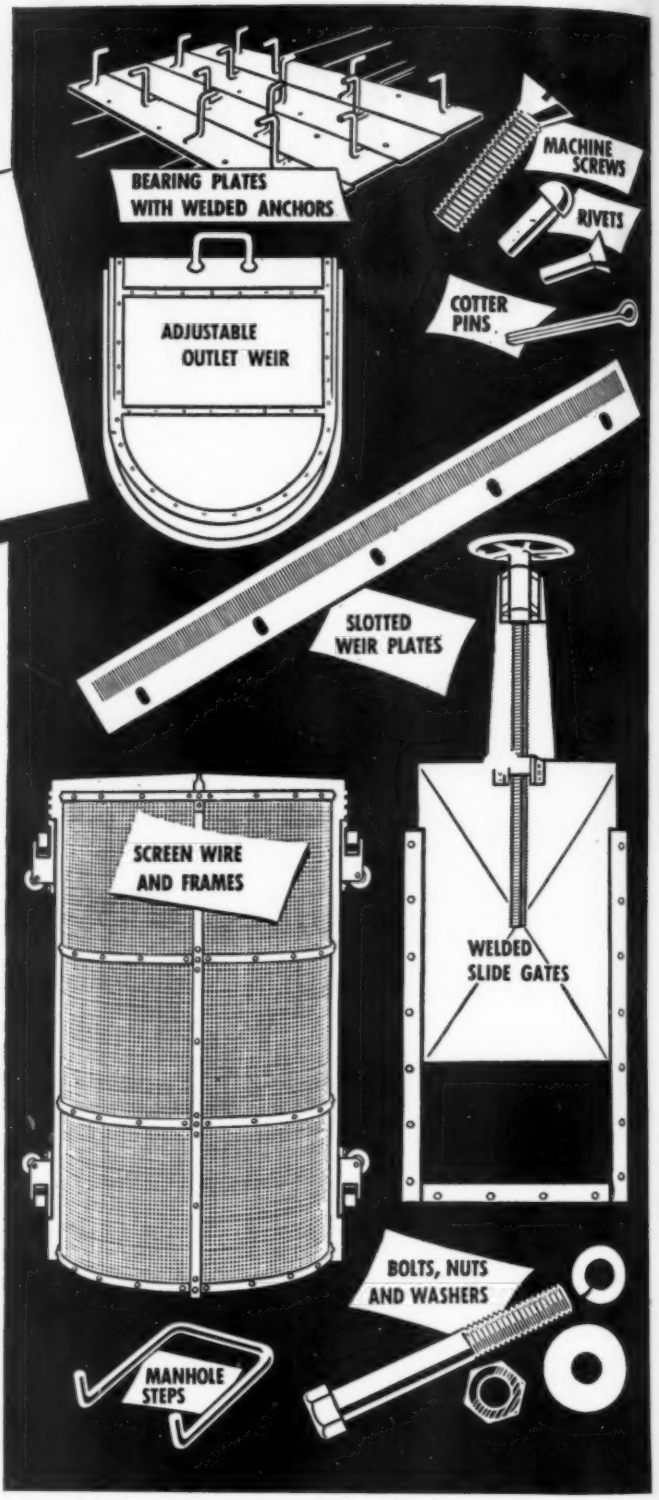
McALEAR

PRESSURE · FLOW · LIQUID LEVEL · TEMPERATURE

controls

for STEAM, WATER, AIR, OIL—GAS

For Parts like these ... use **EVERDUR**



It will pay you for these 4 reasons:

1 Everdur* Copper-Silicon Alloy combines the corrosion resistance of copper with the tensile strength of mild steel, and thus provides trouble-free, economical service under severely corrosive conditions.

2 Everdur makes possible lightweight, built-up construction without sacrificing durability.

3 Everdur is available in practically all commercial shapes and can be readily fabricated and welded.

4 Everdur offers a *proven record* in Sewage and Water Works service... 18-year-old installations are still in excellent condition.

For detailed information, write for Publications E-11 and E-6.

45189

EVERDUR is also widely used for:

Coarse and Fine Screens, Float Chambers, Swing Gates, Built-up Sluice Gates, Coarse Bar Rack Aprons, Effluent Weirs and Scum Weirs, Structural Scum Baffle Brackets, Troughs, Screen Hoppers, Orifices, Baskets, Pipe, Ladders, Float Gage Chains, Valve Springs, Guides, Walkways, Electrical Conduit, Flashboard Supports, Flush Box Fittings, Spillway Fittings, Valve Stems.

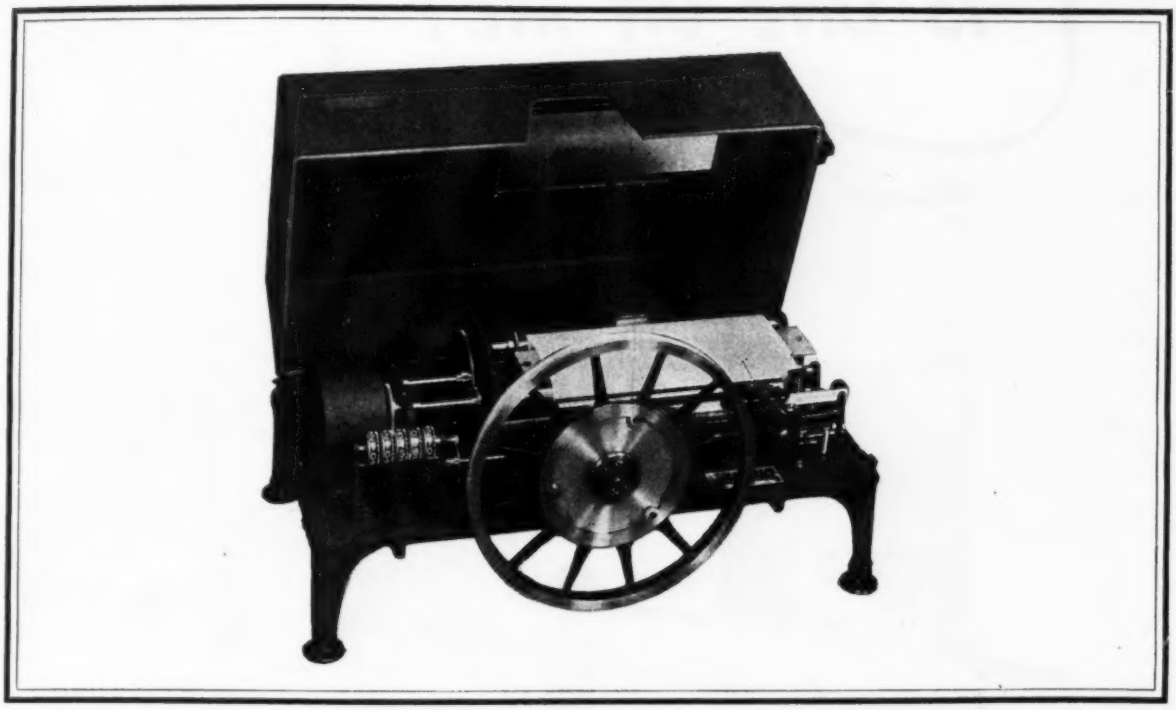
ANACONDA *Everdur Copper-Silicon Alloy*

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Pioneer continuous recorder for river hydrography

FIRST developed in 1911, the Stevens *Type A* Recorder is used the world over. Fundamental principles of the instrument—use of a continuous chart and unlimited range of stages—have not been altered, although minor modifications have been made through the years to improve further utility and accuracy.



STEVENS
WATER LEVEL
RECORDER

Type A35

The *Type A35* consists essentially of a height element mechanism to register elevation of water surface above a chosen datum to a convenient scale, plus a time element mechanism to move a chart at a conveniently uniform speed. Visible graph strip charts 10″ or 20″ wide (also corresponding metric charts) . . . Weight-driven clock (synchronous electric clocks available on order) . . . Non-corrodible metal used throughout . . . One-piece protective hinged cover . . . The *Type A35* is adaptable to remote registration. Write for Bulletin No. 12.

LEUPOLD & STEVENS INSTRUMENTS

MANUFACTURERS SINCE 1907

PORTLAND 13, OREGON

Hydrographic, Surveying, Navigation, Automatic Controls

Leupold & Stevens Instruments
4445 N. E. Glisan St., Portland 13, Oregon
Please send Bulletin No. 12 on the Stevens *Type A35* Recorder.

Name _____

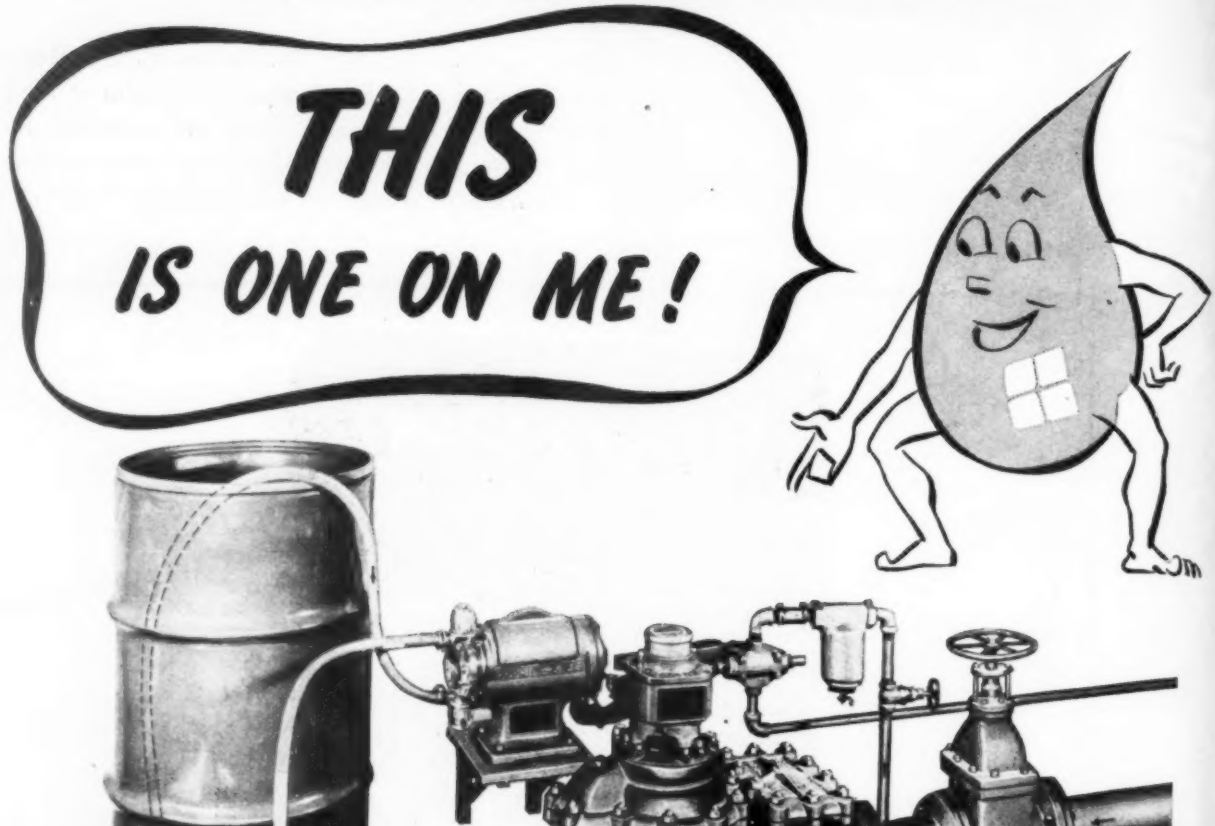
Organization _____

Title _____

Street _____

City _____ *Zone* _____ *State* _____

YOUR WATER SUPPLY SAYS..



% PROPORTIONEERS %

HYDRAULICALLY OPERATED CHEM-O-FEEDER
MAKES YOUR WATER SUPPLY TREAT ITSELF..

It's a neat trick and it works! The Automatic and Proportional Chem-O-Feeder utilizes power from the water supply itself to inject reagents into the line and determine its own rate of feed. Paced by meter, it starts, varies, and stops dosage as the water comes on, fluctuates or tapers off. With %Proportioneers% equipment your water supply will solve its own treating problem . . . prevent dangerous undertreatment or disagreeable taste resulting from wasteful overtreatment. Better water quality due to *accurate* and continuous treatment makes the cost of %Proportioneers% equipment nominal.

Precise chemical feeding is an old story to %Proportioneers%—in over 20,000 installations %Proportioneers% equipment is proving reliable, economical and accurate. Your water supply deserves the best—investigate %Proportioneers%!

Send for Bulletins.

%PROPORTIONEERS, INC.%

9 N. CODDING STREET, PROVIDENCE 1, R. I.

WATER WORKS & SEWERAGE

PUBLICATION OFFICE
330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

"Developments of the Year in Water Supply"

As customary, the water supply and water treatment review for the year, with a discussion of progress and trends and a bit of forecasting of "things to come," will be featured in our January number. The author this year is none other than AWWA's observant live-wire president,

LEONARD N. THOMPSON, Gen'l Mgr.
Water Department, St. Paul, Minn.

"Developments of 1945 in Sewage and Industrial Waste Treatment"

Will be featured in our February number as usual. In addition to the recording of developments in sewage and industrial waste treatment, progress in the abatement of stream pollution generally will also be discussed, along with a discussion of trends and "things to come." The author is no less than the eminent authority, whose earlier reviews written expressly for *Water Works & Sewerage* have been so highly appraised by our readers—

DR. FLOYD W. MOHLMAN, Chief Chemist,
The Chicago Sanitary District, Chicago.

"Public Relations in Water Works Management"

Is in the opinion of *Water Works & Sewerage* one of the best papers written on the important subject of public relations in water utility management. Read before the West Va. Section of AWWA last month, this paper and the program of the Huntington Water Corp. in public relations, as conceived and executed by the author, won for him the Geo. W. Fuller Award voted by the W. Va. Section. Deserving the attention of water utility managers in general, this paper is the contribution of—

MAX K. JONES, Manager,
The Huntington (W. Va.) Water Corporation.

"Cavitation in Pumps"

Is an excellent discussion of the phenomena and truths concerning cavitation in centrifugal pumps. This paper reveals some misconceptions generally held concerning the causes of cavitation, and suggests methods of correction of this noisy and destructive condition, which is more commonly experienced than is generally realized. This article was prepared at our special request in order to clear up many false conceptions concerning the cause, effects and proper measures for the correction of damaging cavitation. The author is—

ROBERT W. ANGUS, M.E., Prof. Emeritus,
Dept. of Mechanical Eng., Univ. of Toronto.

"Fine Filter Screens for Sewage Treatment"

Constitutes an analysis of the most efficient design of fine screens for sewage and industrial waste treatment. The discussion reveals the good and bad features of design and construction of this type of mechanical screen which may be operated either as a screen or a straining filter when assisted with an applied filter medium, such as fine grained or fibrous materials. The author with considerable experience in fine screen design and operation is—

G. MACLEAN GARDNER,
Ann Arbor, Mich.

"Mathematics for Water and Sewage Works Operators"

Is a fundamental presentation of what every good operator (and sanitary engineer, too, for that matter) should know about fractions, decimals, percentage, proportion, physical units, rates, significant figures, graphs, logarithms, solutions, elementary hydraulics, averages, and other mathematical operations involved in the recording and calculation of data in the management and operation of water and sewage plants. The professor is—

DR. WARREN EGLOF, Prof., Chemical Eng.,
Niagara University, New York.

VOL. 92, NO. 12 — DECEMBER, 1945

CONTENTS

London's Water Supply 353
By Lt. Col E. F. W. Mackenzie, O.B.E., M.C., M.B., Ch.B., D.P.H.
Director of Water Examination
Metropolitan Water Board
London, England

Financing Water Mains in Newly Opened Areas 358
By William P. Melley, Supt.
Water Department
Milton, Massachusetts

Meeting of North Carolina Section 361

Prestressed Reinforced Concrete Pipe 367
By F. F. Longley, Vice Pres.
Lock Joint Pipe Co.
East Orange, New Jersey

Chinese Take Over Water Systems from Japs 372
By Col. Arthur Morrill, USPHS
Tientsin, China

A Practical Carbon Feeder 373
By Vester Opie, Chief Engineer
Dept. of Water, Light and Ice
Paris, Missouri

Service to Small Plant Operators 375
By Chris. F. Bingham, Mgr. Industrial Sales
Virginia Smelting Co.
West Norfolk, Virginia

North Dakota Conference Meets in Fargo 377
As reported by Kenneth Piper

New Jersey Section AWWA Annual Meeting 380

Industry Converts Sewage Works Effluent Into Water Supply 383
By Wm. P. Hill, Engineer
Bethlehem Steel Co.
Sparrows Point, Maryland

Features of Contractual Agreement for Use of Sewage Effluent As Industrial Water 388
By Norman D. Kenney, Cons. Engineer
Whitman, Requardt & Associates
Baltimore, Maryland

The Disposal of Industrial Wastes 391
By George E. Symons, Ph.D., Associate Editor
Water Works & Sewerage
New York, N. Y.

Water and Sewage Patents 397

Ohio Section's Divisional Meetings 399

Editorials 400

Meetings Scheduled ..... Ad. Page 98

Here and There with "Doc" Symons 100

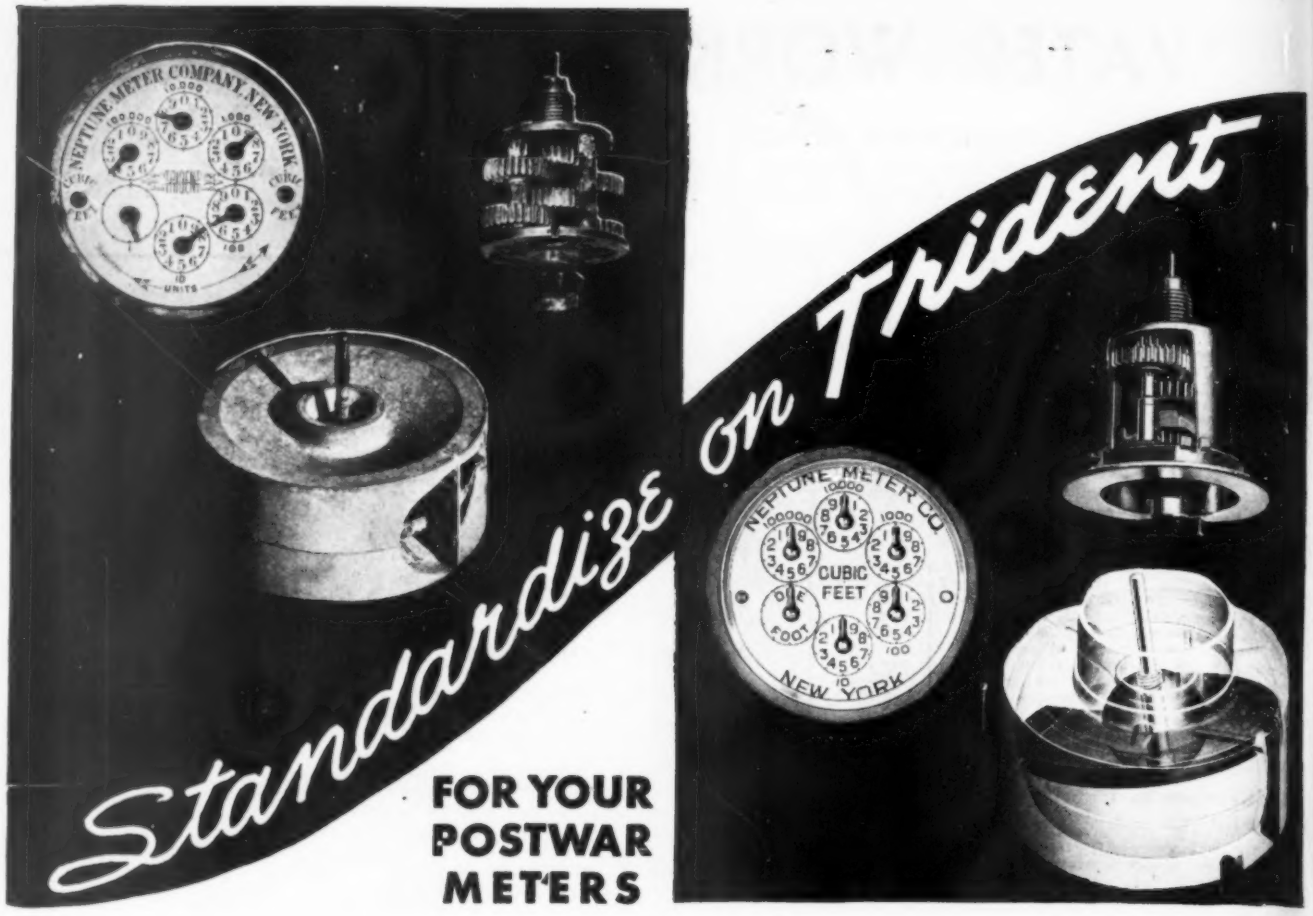
"The Spillway" ..... Ad. Page 105

Manufacturers' and Equipment News 107

Literature and Catalogs Received 120

Annual Index .....

H. P. GILLETTE, Pres.; E. S. GILLETTE, Vice Pres. and Publisher; L. H. ENSLOW, Vice Pres. and Editor; J. C. BLACK, Mgn. Editor; GEORGE E. SYMONS, Associate Editor; Editorial Associates—J. R. BAYLIS, A. M. RAWN, H. A. FABER; H. J. CONWAY, Adv. Editor; L. D. SANDERS, Make-Up Editor. *Chicago Office*, Norman T. Burke, Rep., 330 S. Wells Street; *Cleveland Office*, Lee B. McMahon, Mgr., Leader Bldg.; *New York Office*, J. M. Angell, Jr., Mgr., 155 East 44th Street; *Los Angeles Office*, Don Harway, Rep., 816 W. Fifth Street.
WATER WORKS & SEWERAGE is a monthly publication. Single Copies, 25 Cents; Subscription Rates U. S. and Canada, $2.00 per year; Foreign, $3.00 per year.



Standardize on Trident

FOR YOUR POSTWAR METERS

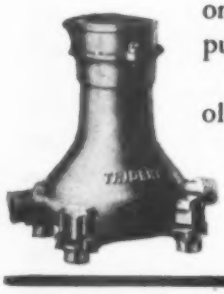
Trident Interchangeability means true Standardization

Instead of keeping an assortment of old registers for old meters . . . you have your small stock of Trident Registers. Any one of them, new or reconditioned, will fit perfectly into any Trident Meter, of the size for which it was made.

Instead of an accumulation of various types of old gear trains for old meters . . . you pick out any modern Trident Gear Train from your stock. It will fit perfectly into your Trident Meter, old or new. Gear trains for 5/8", 3/4" and 1" sizes are identical.

Instead of looking through an assortment of measuring chambers for use in a discontinued model meter . . . when repairing a Trident Meter, you need only select a chamber made that size. It will fit perfectly, even tho meter was purchased 40 years ago!

This is true standardization—thru Trident Interchangeability. No wonder old Trident reconditioned Meters approach "new meter" accuracy and sensitivity.



NEPTUNE METER COMPANY • 50 West 50th Street • New York 20, N. Y.

Branch Offices in CHICAGO, SAN FRANCISCO, LOS ANGELES, PORTLAND, ORE., DENVER, DALLAS, KANSAS CITY, LOUISVILLE, ATLANTA, BOSTON.
Neptune Meters, Ltd., Long Branch, Ont., Canada

SYMBOL OF SUSTAINED ACCURACY

ECONOMY IN INVENTORY, STORAGE & MAINTENANCE THRU TRIDENT

Interchangeability

WATER WORKS
& SEWERAGE

VOL. 92. No. 12 *A Gillette Publication* DECEMBER, 1945

LONDON'S WATER SUPPLY

Experiences in Safeguarding Its Purity in War

By LT. COL. E. F. W. MACKENZIE,
O.B.E., M.C., M.B., Ch.B., D.P.H.
Director of Water Examination
METROPOLITAN WATER BOARD
LONDON, ENGLAND

IT was more than three and a half centuries ago that the City Fathers of London granted a 500 year franchise in 1582 to a Dutchman named Peter Morrys with the right to draw water from the River Thames by pumps driven by water wheels set in one of the arches of the old London Bridge.

Since that time London's water supply, which in 1701 was transferred in entirety to a corporation, has had its share of historically famous names and persons: Hugh Myddelton and his New River Aqueduct; Dr. John Snow and the Asiatic cholera epidemics; Sir John Simon; James Simpson and the slow sand filters at Chelsea Water Works; the Royal Commission and the Metropolis Water Act of 1852; Sir Edward Frankland; and the introduction of bacteriological technic in 1882 by Dr. Angus Smith.

An act of 1902 created the Metropolitan Water Board of London. Importantly, this act also placed upon the Board certain duties in connection with

One of London's Newer Pumping Stations
(A direct bomb hit would have been fatal since the heart of the supply depends upon continuous operation of this station.)

laboratory control procedure designed to ensure the safety of the supply. This was the genesis of the Water Examination Department, which came into being in November, 1905 with the appointment of Dr. Alexander Houston as the first Director. Dr. Houston already had noteworthy experience with water analysis and purification, having been bacteriologist to the Royal Commission on Sewage Disposal, and having, only a short time previous, in collaboration with Dr. McGowan, controlled the water-borne typhoid epidemic of 1905 in Lincoln by chlorinating the water supply. His decision to resort to chlorination of Lincoln's water supply was based on an earlier experience with chlorination of sewage and polluted waters.

In 1904 the Metropolitan Water Board, created in 1902, took over the private companies supplying water to London; thus once more restoring water supply service and control to municipal authority which had voluntarily surrendered such control over two centuries before.

From the creation of the Metropolitan Water Board up to 1909, filtration through slow sand filters, similar in design to those introduced by Simpson, was relied on for the purification of all river-derived water. Sir Alexander Houston, however, during his years of office as Director of Water Examination, which began in 1905, introduced a number of revolutionary changes. Chief among these were the regular use of river water which had been purified by passage through a storage reservoir (1909), chlorination (1916), the use of primary mechanical filters antecedent to slow sand filtration (1923); and the use of ammonia as a means for reducing the tastes produced by chlorine alone.

These processes are still in use and, in conjunction with slow sand filtration introduced by Simpson in 1829, are relied upon to ensure that the water shall not be injurious to health.

The Water Supply Today

The Metropolitan Water Board, as it exists today, comprises 12 filtration works and some 60 well stations. It supplies an area 575 square miles in extent containing over 7,000,000 people. The water is supplied through a distribution system of pipes 8,000 miles in length. Approximately two-thirds of the water is derived from the River Thames, one-sixth from the River Lee and one-sixth from deep wells sunk in the chalk.

The wells are usually of great depth and the water delivered from them is of excellent physical quality. For many years it was supplied without any treatment, but the increasing urbanization of the country districts around London and the excessive pumping which now takes place has led to a progressive deterioration in the quality of the water lying in the great chalk basin beneath London and this has necessitated the chlorination of all well-derived water, but no other treatment is required.

The river waters, on the other hand, are heavily polluted, contain silt and a great variety of aquatic life. They require somewhat elaborate purification before they are suitable for domestic use. Broadly speaking, the methods of purification employed at the outbreak of war were first, storage in large reservoirs which achieves considerable bacterial purification and permits settlement of the river silt; secondly, filtration through slow sand filters either alone or preceded by rough filtration through primary mechanical filters, used without a coagulant; and thirdly,

The Author

chlorination before and after filtration. In more recent years activated carbon has been used in eradication of tastes.

Control of Water Quality

The routine control of quality of the water is exercised by the daily examination of samples representing the water in every stage of purification. Widespread random sampling from mains and consumers' taps throughout the area of supply is also practised, and enables the soundness of the distribution system to be checked at frequent intervals. At the same time the quality of the water as received by the consumer is kept under frequent observation. During the year, no fewer than 38,351 such routine analyses are made. In addition constant researches are made for improved methods and special investigations are performed in connection with engineering and other problems which arise in connection with the works. These have, in the past, contributed much to the sciences of water analysis and purification.

The results of the routine analyses are recorded in graphic form upon charts which are displayed in a room designed for this purpose. By this means it is possible at a glance to ascertain the state of the water in each stage of its progress through any particular works. Measures which may be desirable to safeguard the purity of the supply can thus be anticipated and chemical treatment applied, increased or diminished in accordance with requirements.

WAR AND THE WATER SUPPLY

After the historical meeting at Munich in September 1938, and the annexation of Czechoslovakia to the German Reich, the possibility of a European war and the preparations which might be necessary to meet this eventuality had constantly occupied the attention of those responsible for the purity of London's water supply. As the fateful intervening year progressed, the completion of plans and the hurrying forward of preparations became a matter of the greatest urgency. Conferences were held, available methods and apparatus were reviewed, and experiments were performed, until an outline of what the future might bring and what steps might be taken to meet it, began to take shape.

It seemed justifiable to believe that the first manifestation of a state of war might be an aerial onslaught upon the heart of the Empire and that the works of the Metropolitan Water Board, which perform the vital function of supplying one-sixth of the people of England with the most essential commodity required by man, would be selected as a special target for destruction; upon this belief were based the plans for protecting the supply.

What I have to say naturally concerns chiefly the work of the Water Examination Department* and I wish to make it clear that the main burden of the day fell upon the Chief Engineer's Department. Theirs was the duty of restoring the supply—ours of keeping it pure. Our two aims might well have been antagonistic, but common policies were soon hammered out and any success which we achieved must be attributed to the very close co-operation which came from a realization of each others difficulties.

Before describing the measures which were taken it would be well to picture what might have been the consequences had the water from one of the Board's major works become infected with the germs of typhoid, which is now the most to be feared of all the water-borne diseases.

Judged by past epidemics, it might be expected that infection of a filtration works of average size would result in 16,000 cases of typhoid with 1,600 deaths and the establishment of between 300 and 800 permanent carriers of the disease, as a reservoir of infection for the creation of further outbreaks. The significance of this can best be appreciated by comparison with the Croydon epidemic of 1937, in which 323 cases and 43 deaths occurred.

The foregoing estimate inadequately represents the probable state of affairs, for the water delivered from any one of the Board's works does not supply an isolated area. There is wide-

*The Department of Water Quality Control perhaps more adequately describes this department.—Editor.

spread intercommunication between the water mains throughout the distribution system and even a comparatively small quantity of infected water might contaminate that supplied from other works. It is, therefore, not possible to place any limit upon the consequences of contamination of the supply from any particular works.

One may well be able to picture what might have been the effect upon the morale of the people of so disastrous an occurrence, and of the knowledge that each such incident would increase the probability of further similar epidemics.

Measures to Secure Protection

These were the dangers against which it was imperative that the highest degree of protection should be afforded, and the following paragraphs describe the measures which were taken to secure this protection.

High in the order of priority came the necessity to ensure that there should be no interruption in laboratory examination and control of the supply, for without this there would have been no means of assessing the need for, or the success of, other measures. Among the first steps to be taken were the selection of suitable buildings in comparatively safe areas and their conversion into alternative laboratories. Before the outbreak of war these emergency laboratories were fully equipped and ready to bring into operation without interruption of the works.

The use of prechlorination, in high doses when necessary, was extended to all filtration works, thus ensuring that the water was in a state of considerable bacterial purity before reaching the filters. This increased the main lines of defense to four, namely, storage, prechlorination, filtration and terminal chlorination. This was undoubtedly the most important factor in preserving the purity of the water pumped from the works, for there was no occasion upon which less than two of these lines remained intact.

The residual chlorine in the water passed into supply was increased to the highest level consistent with the avoidance of serious cause for complaint. Complaints there were, but when the reason for the taste was explained to the people it was gladly accepted and, indeed, welcomed. This residual chlorine provided against pollution through infiltration of ground water into broken filtered water channels and also gave some protection against failure to effect complete sterilization of fractured mains as a result of either physical difficulties, which often existed, or the fallibility of human nature.

Chemical Poisons

The possibility of the introduction of chemical poisons into the water either deliberately, or accidentally as by the use of poison gas bombs, was countered by a system of guards at works and reservoirs and by arrangements for the immediate testing at the works for poisons should there be any suspicion that the water might have become contaminated.

A staff of analysts and sample collectors was also maintained at the Central Laboratories day and night for the purpose of carrying out confirmatory tests and daily examination for poisons was made on samples representing the contents of every pipe passing water from the filtration works.

The Importance Attached to Chlorination—Involving 150 Possible Application Points

It will be evident that chlorination was to play a most important part in our defensive measures and it was necessary that every possible step should be taken to prevent any interruption in this vital process. Although chlorination had been in use by the Board for a considerable time, it was still regarded as somewhat subsidiary to the older purification processes.

One of the Metropolitan Water Board's Primary Filters

(Note the 20-in. depth of gravel bed in five grades, and the relatively shallow sand bed. Note also the method of taking off the dirty wash water through slot like syphon outlet ports barely above the sand surface along the center gullet between the two halves of the filter. This method, known as "tipping" the filter, is used in conjunction with a preliminary air-scrubbing wash, after which the dirty water is essentially completely "tipped" off to the sewer. After the "tipping" operation the take-off syphons are air-locked with compressed air, admitted through the piping shown, and the completing water wash or rinsing wash is given. Exterior of the Filter Building is pictured on the cover of this issue.)

One Section of M.W.B.'s Chemical Laboratories
(Known as the Still-Room.)

This view had now to be revised, for acts of war might at any moment have rendered it the most important or, indeed, the only barrier against the spread of water-borne diseases.

A wholesale program of reconstruction was planned and received the immediate approval of the Board. Where unsuitable buildings were in use, new buildings of blast and splinter-proof construction were designed; where existing buildings could be adapted and protected this was done; where necessary, chlorinating instruments were duplicated and for every chlorinating point a duplicate was provided at a distance from the existing building in case this should be destroyed. To provide against failures of water pressure essential to the operation of chlorinating instruments, alternative supplies were provided from two or more sources; in many cases special pumps were installed to boost the pressure or to furnish an independent supply; a reserve of portable pumps was maintained in readiness for immediate transportation and installation wherever they might be required.

It was anticipated that it might become necessary to apply chlorination in emergency, at points where no apparatus existed and for this purpose a large number of portable gas chlorinators and wooden huts were purchased. Special chlorine gas diffusers were designed which would enable the gas to be fed directly into the water where suitable conditions existed instead of being delivered as a solution of chlorine, should no water supply for this purpose be available. Whenever and wherever there was interruption to chlorination it was possible to re-establish it within a few minutes. This work involved the detailed consideration and replanning of over 150 chlorination points.

Pollution of Mains by Sewage

There could be no doubt that the most serious danger would be created by the fracture of water mains and sewers in close proximity in the streets, resulting in the admission of sewage to the water mains. Protection against the consequences of such incidents was provided by the rapid closure of valves by turncocks and by instructions to the effect that no main should be put back into supply after repair until it had been thoroughly flushed and disinfected by chlorine.

Whenever possible, repaired and sterilized mains were examined bacteriologically before being restored to supply, but frequently they were so urgently required for fire fighting that this could not be justified. Sterilization by chlorine was, however, *never* omitted and large mains involving a widespread risk were invariably examined bacteriologically before being restored to use. Special mobile chlorinators were provided and the whole of London was divided into areas to each of which some were allotted.

Central control was maintained and a reserve of chlorinators was held directly under my orders, thus enabling relief to be provided in districts where the work was exceptionally heavy. Some difficulties in the rapid sterilization of mains were encountered in the early days, due chiefly to the almost complete disorganization of communications. but these were rapidly overcome and, as experience was gained, the whole organization worked smoothly and without avoidable delay.

Water for Fire and Emergency Supplies

It was not only necessary to conserve the purity of the supply. When the enemy resorted to fire raising, quantity became second only in importance to purity for, without water, London might have been destroyed by fire. The greatest need for water frequently coincided with heavy damage to the works and consequent limitation of their output. Decisions had to be taken, often on the spur of the moment, as to the extent to which orthodox methods of purification might be discarded to increase production without imperiling the health of the people.

A Section of the "Met's" Bacteriological Labs.
(The Sterilizing Room)

There is no hard and fast line between a safe and an unsafe water and such momentous decisions were not easily taken, for they had, of necessity, to be based upon personal opinion. It must be admitted that the taking of them was assisted by the gravity of the situation and it can fortunately be said that there was no occasion when the quantity of pure water available was insufficient, or that there was at any time deterioration in its bacterial purity. Local shortages there were, but these were due to the immense damage to the mains and this was remedied with remarkable rapidity by the engineering staff of the Board.

It was evident that, whatever precautions might be taken, interruption of piped supplies might occur. Arrangements were therefore made to deliver pure water by tank wagons and steps were taken to enable emergency supplies to be maintained if necessary from private wells and casual surface water sources which are widely scattered almost throughout London.

A survey of all such sources was made entailing the laboratory analysis at frequent intervals of samples drawn from over 700 possible sources of supply. A large number of mobile filtration units of the type used by the Army was provided for the treatment of emergency supplies drawn from surface waters and an organization was set up which entailed the training in emergency purification methods of over 7,000 volunteers.

Extent of Damage

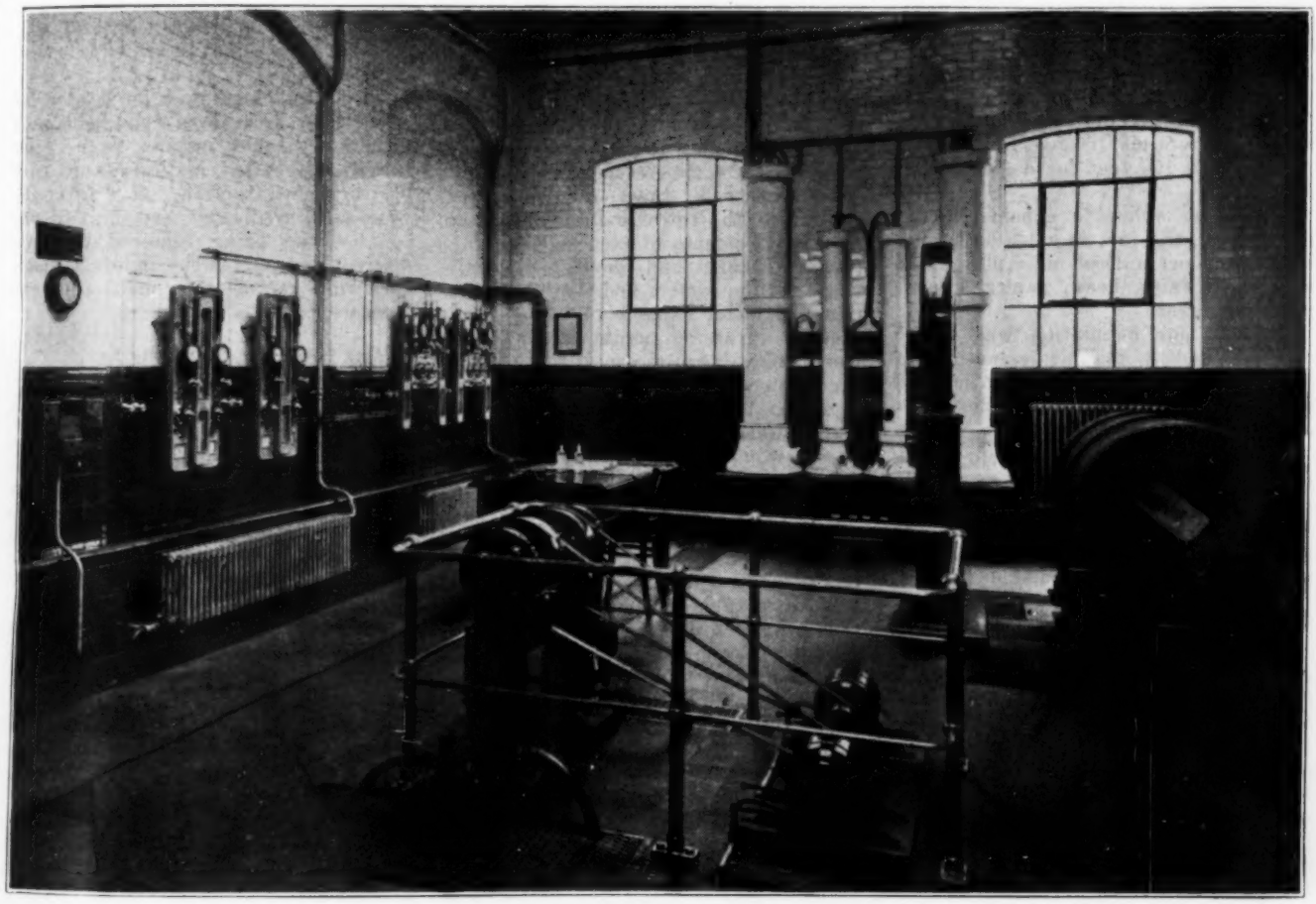
During the aerial attacks on London almost every conceivable form of damage which might have prejudiced the purity of the supply was inflicted upon the undertaking. Damage to sewers in the outskirts of London necessitated the discharge of untreated sewage into the rivers from which raw water supplies were drawn; reservoirs were cut off from the works by the destruction of aqueducts, thus necessitating the passage of unstored raw river water to the filters, bombs fell into the filter beds and caused short circuiting between the unfiltered and the filtered water channels. At times it was even necessary to bypass the slow sand filters to enable the supply for fire-fighting to be maintained. Damage to the distribution system was particularly severe. In one night alone over 500 mains were fractured and many became heavily charged with sewage.

All the necessary protective measures were, however, in readiness and there is not a shred of evidence that the water supplied to London was at any time less safe than before the war. During the four years 1940-43 bacteriological analyses were performed on over 50,000 samples drawn at the works, from mains pumping water into supply and throughout the distribution area, particularly in those localities where bomb damage had been heavy.

Of these 50,000 samples, 99.3 per cent showed the absence of coliform bacteria in 100 ml., that is to say, they conformed to the highest standard of bacterial purity despite the extensive damage which was frequently inflicted and the many opportunities for dangerous pollution which were created. This represents a bacterial purity, during these years of war, higher than ever before and it has never been suggested by any health authority that a single case of disease occurred in London which might have been attributed to the water supply.

This record was recognized by the Minister of Home Security on October 2nd, 1943, in the following words:

"There were many fractured and broken mains, bringing with them all the perils following contamination of water—one of the chief causes of typhoid. Let me say frankly we stood at that time in real danger of a typhoid epidemic, but records show that—thanks to the precautions which were taken—there was not one single case of this terrible disease due to enemy action."



One of M.W.B.'s Chlorination Stations

(It is to be remembered that London pioneered in water chlorination under Houston's direction. It is also to be recalled that this outstanding authority preached the axiom that bad tastes could most usually be charged to "chlorine temerity" rather than "chlorine boldness," as he expressed it.—L. H. E.)

FINANCING WATER MAINS IN NEWLY OPENED AREAS

With Particular Reference to Requirements of Real Estate Developers.

By WILLIAM P. MELLEY
Superintendent
WATER DEPARTMENT
MILTON, MASS.

MILTON, Mass., borders Boston on its southerly side, and is predominantly a residential suburban community. Other than a portion of a nationally-known chocolate mill there is no manufacturing of importance in the town and there will not be, as a very rigid zoning law prohibits industry. Incidentally, the same law bars the building of apartments, and forbids the erection of more than single family dwellings unless built on a lot between existing two-family houses.

The Author

In addition to restrictions on the size of the lots the law provides that frontages shall be not less than 75 feet for a 7,500 foot lot, 100 feet for a 20,000 foot lot and 150 feet for a 40,000 foot lot.

When the above is considered, together with the fact that we have only 53.3 takers per mile of main pipe, it all adds up to fairly heavy capital investment per taker.

In 1923 our population was 11,295 and we had a taxable valuation of $21,000,000. By 1944 the population had increased 90%, to 21,502 and the valuation, 84%, to $38,600,000.

Growth began with new developments in 1924 and, although it was not of the mushroom type experienced by some western towns, it was nevertheless steady and continuous and was, on the whole, of the better type.

Developments naturally require main installations, and because some of these came in localities where the distribution system was weak there was the further requirement that existing lines be reinforced and improved. Hence a relatively large sum of money was required for the extension of main pipes. It would be impossible to pay for such installations wholly from revenue unless rates were to be increased tremendously. Therefore, only two sources for funds remained. The town could appropriate the needed sums from the general tax levy, or bonds could be issued.

Our rates for water were on the high side already and the Board of Water Commissioners did not feel justified in increasing them.

A Self-Supporting Department Our Aim

It was decided at this time that the Water Department should be self-supporting, i.e., the town should not make any "gift" appropriations to the Water Department, and by the same token, the surplus funds of the Water Department, if any, should be reserved for Water Department uses.

Rate increases and financial assistance from the Town Treasury being ruled out, the only alternative was to bond our requirements. At this time we could issue bonds under our state enabling act for periods up to thirty years but in 1928 an act of the Massachusetts legislature reduced the period for which mains could be bonded to fifteen years. This doubled our requirement of funds to meet annual maturities during the life of the bonds.

At the same time a survey was made which showed that the scattered growth of the town and the increased flow requirements of modern fire-fighting apparatus had developed weaknesses in the system and that the quantities of water capable of being delivered at strategic points in the town were below requirements for modern fire protection. In fact, our information was that unless certain improvements were made fire insurance premiums would increase about 15 percent.

Fire Hydrant Rental Allowed the Department

As a considerable amount of the money being spent was for the protection of taxable property, it was felt that a portion of the resulting expense should be borne by the taxpayer rather than the water taker. The town therefore voted to pay to the Water Department the annual sum of $35.00 per hydrant. This income proved to be of marked help in financing the reinforcing of our distribution system.

Bonds were issued each year for our estimated annual needs and this continued up to the start of the war. As a result, ten years ago our outstanding debt reached a peak of just over a half-million dollars. This has tapered off, assisted by the war years, when we made no capital improvements of importance, until now it is only $228,000. However, even now, more than a third of our income is required to pay interest on the serial bonds and retire them as they mature.

The Board of Water Commissioners in studying postwar problems and programs became concerned with the probable debt in the postwar years if predictions of active development of real estate were correct.

It was evident that Milton had land available for development, and that the town, with its natural beauty, lying between the low-land approaches to Massachusetts Bay on the east and the Blue Hills on the west, its freedom from politics (we still have the Town Meeting form of government), its availability to Boston through improved rapid transit facilities, and its low tax rate, was attractive to prospective homeowners.

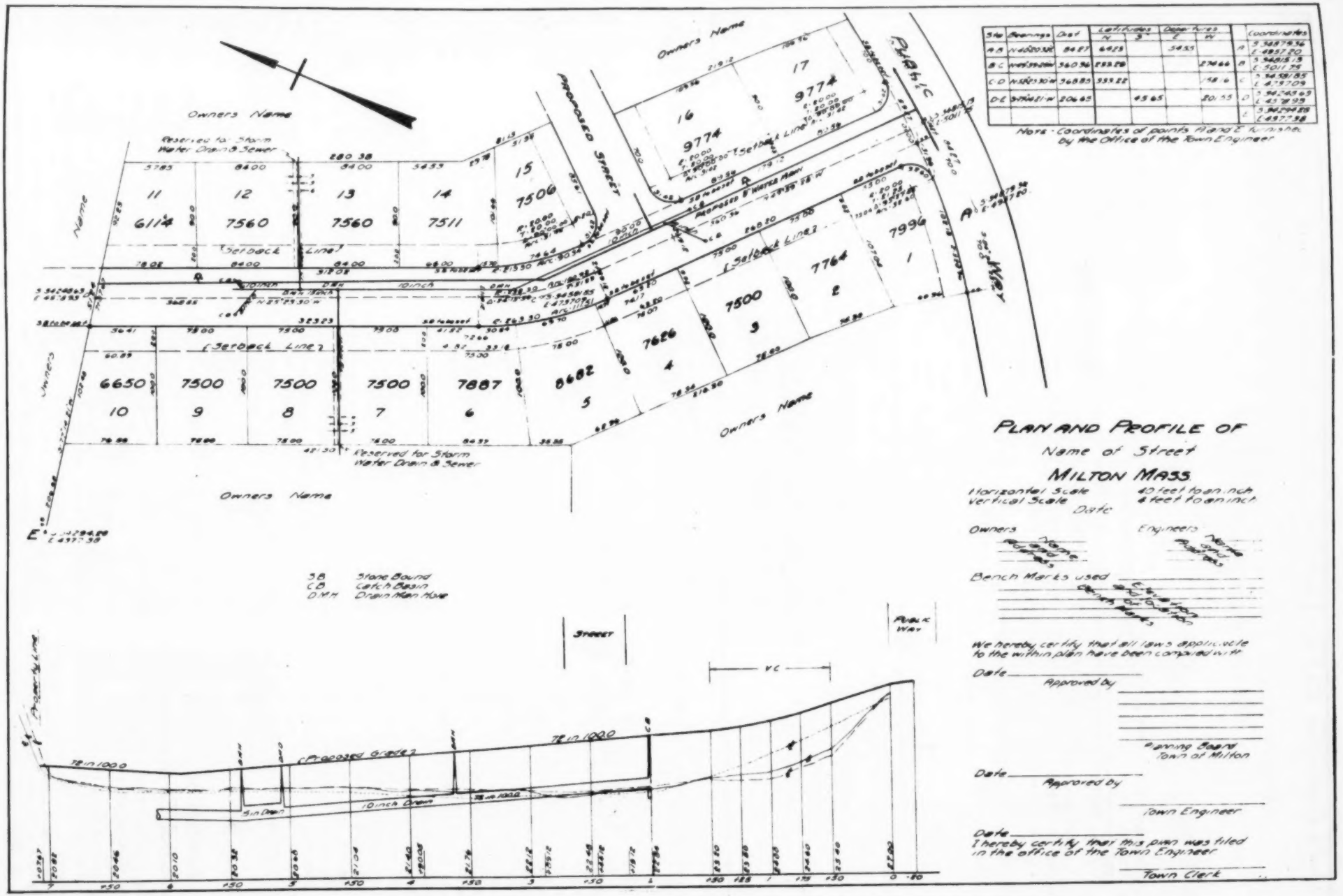
It was indicated that we were in for a boom or at least a relatively rapid growth. Growth means more water mains and water mains require cash for their construction. In view of the fact, as stated, that one-third of our income was being required for bond interest and retirement, unless our policies were revised this one-third might increase to a half or more.

What Was Done About It

Under the old regulations an applicant was required to deposit one-third the estimated cost of a water main in a local bank to the order of the Department, and would sign an agreement guaranteeing a return to the Department of 6 percent per annum for a period of 6 years. Whether or not the income so provided was adequate is debatable, but it is the method most generally used in New England and is regarded as sufficient for carrying charges.

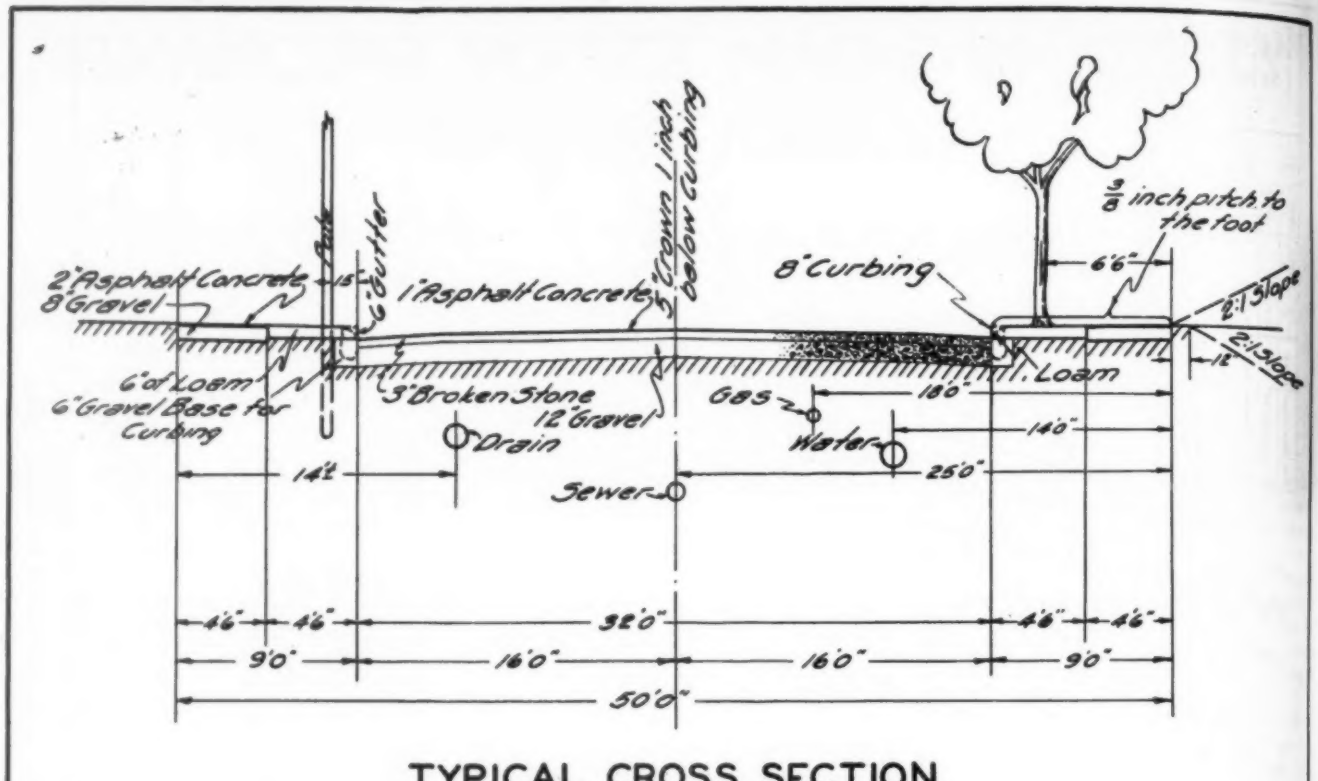
However, it still leaves the cost of the capital investment to be raised (and later liquidated) and in our case this meant bonding, with, off in the future, interest and retirement facing us.

The Planning Board had drawn up regulations which required developers of new subdivisions to build roads in the newly-opened areas, subject to specifications and approval of the Town Engineer. Conferences between the Planning Board, the Boards of Water Commissioners and Sewer Commissioners resulted in a revision of Planning Board


PLAN AND PROFILE OF
Name of Street
MILTON MASS
Horizontal Scale 40 feet to an inch
Vertical Scale 4 feet to an inch
Date
Owners
Engineers
Bench Marks used
We hereby certify that all laws applicable to the within plan have been complied with
Date
Approved by
Planning Board Town of Milton
Date
Approved by
Town Engineer
Date
I hereby certify that this plan was filed in the office of the Town Engineer
Town Clerk
Note: Coordinates of points marked E furnished by the Office of the Town Engineer
Proposed Street
Public Way
Reserved for Storm Water Drain & Sewer
Proposed 8 Water Main
Setback Line
Owners Name
SB Stone Bound
CB Catch Basin
DMH Drain Man Hole
12 in 1000
10 inch Drain
8 in Drain

Specimen of Standard Plat of Detailed Plan and Profile for Water Main Extensions in Milton, Mass.

(The applicant for water main extensions must submit such plats to the Water Dept. for approval before filing with the Town Planning Board along with a performance bond.)



Typical Cross Section of Fifty Foot Street

(Appears in Milton's Planning Board Regulations for purpose of revealing where water, sewer and gas lines are to be located in new streets, depth of mains, etc.)

regulations and later, a new town by-law. The latter, incidentally, was passed at Town Meeting without a dissenting vote.

The by-law provides that the developer who wishes to open a tract of land for building purposes shall deposit with the Town Treasurer the estimated cost of installing water mains of proper size in the roads together with service connections to each lot line. Provision is made for the refund of that part of a deposit in excess of actual cost, or for additional deposit in cases where the estimate proves to be insufficient.

The regulations of the Water Department are both amplifying and restrictive. Among other things they permit the developers to do the trenchwork, both excavation and backfilling (under supervision), but require that the piping be installed by the Water Department.

What Real Estate Operators Thought of It

The officials of the town, its citizens, and real estate operators are in agreement that the plan is best for all concerned and that while it may slow up developing it will have the effect of increasing property values.

The Planning Board will not approve the layout of subdivision of land, and a building permit cannot be issued, until a plat is submitted together with an application for approval including, among other things, the size and location of "proposed water mains and their appurtenances as approved by the Board of Water Commissioners." Such a detailed plat is reproduced with this article. A performance bond, covering water, sewer and drainage installations and the surfacing of the road must also be furnished to the Planning Board.

A result of the severity of the by-law and the related regulations of the Planning Board and Board of Water Commissioners will be to have more orderly developments, with improvements installed at no expense to the town except for future maintenance.

Of equal, if not greater, importance is the protection provided to the individual owner. He will live on a street which is properly surfaced and in which are the several utilities he will use for comfortable, healthful living. He will have no betterment assessed against his home.

Finally, the expense of mains installed in new subdivisions will be borne originally by the developer and passed along by him to the home purchaser, relieving the water-taker from paying in his rates for benefits gained by new residents.

Special Service in Municipal Communications

Charles Lehman Opens Consulting and Special Service Office

A new consulting engineering service is being offered by Charles D. Lehman of Flossmoor, Ill. Mr. Lehman, a graduate electrical engineer of Ohio University and a licensed professional engineer in Ohio, will provide an engineering service in municipal communications for fire protection, water supply and distribution and other municipal functions.

Mr. Lehman is experienced in communication work, having had experience in this field with the Penna R. R., the Chesapeake and Ohio, The National Board of Fire Underwriters, and the Safety and Security Div. in the Office of Chief of Ordnance of the Army Service Forces.

G. D. Houtman Opens Consulting Office

G. D. Houtman, vice president of the Pennsylvania Association of Boroughs, and for the past twenty years Asst. County Engr. for Delaware Co., Penna., has opened a consulting office at 14 South Ave., in Media, Penna. Mr. Houtman will practice Civil Engineering, including land surveying, and municipal and structural engineering.

MEETING OF NORTH CAROLINA SECTION

1945 Annual Meeting of N. C. Section of AWWA Jointly with the N. C. Sewage Works Ass'n. Rivals Pre-war Meetings

Chairmen

(Incoming)	(Outgoing)
L. I. Lassiter	*E. M. Johnson*
Sanitary Engr.	*Supt. of Water*
Wilmington, N. C.	*Raleigh, N. C.*

THE annual joint meeting of the North Carolina Section of AWWA, and the N. C. Sewage Works Association held Nov. 6th and 7th, in Charlotte, N. C., took on the appearance and tempo of pre-war meetings held by these two associations. Amongst other things, the return of manufacturers' exhibits, which have long been held in connection with the North Carolina meetings without cost to exhibitors, was a prominent feature of the meeting.

A unique feature, in connection with operation of the efficiently run registration desk, was the Attendance Board on which were hung large cards revealing the name and position of registrants. This board of names, easily read at a distance in the exhibit area, served as a continuously current registration list all during the meeting —also revealed who were members of the Section and who were not in an effective manner.

On the evening of the 5th a pre-conference Informal Smoker or "Get Together" was staged for the benefit of early arrivals. So well attended was this "get-together" that the size of the room provided proved inadequate.

Honors and Awards

During the Annual Dinner the following awards were made:

To—**J. W. Kellog**, Ass't Director of N. C. State Health Dep't Laboratories, went the Geo. W. Fuller Award of the N. C. Section of AWWA, in recognition of his leadership in Short School work and services to the Section.

To—**Col. H. B. Gotaas**, Director of Sanitation and Engineering, Office of Inter-American Affairs, and recently elected President of the Institute of Inter-American Affairs, who has been in charge of sanitation in 18 Latin American countries and decorated by two of them, was voted the Kenneth Allen Award of the N. C. Sewage Works Ass'n in recognition of his leadership and prowess in improving sanitation in Latin America. The citation was lengthy and deserved by this adopted son of the "Tar Heel State" where he formerly taught Sanitary Engineering at the Univ. of N. C. before entering the armed services.

Honored

Col. H. B. Gotaas	*J. W. Kellogg*
President	*Asst. Director*
Inst. Inter-American Affairs	*Laboratories*
Washington	*State Dept. Health*
(K. Allen Award)	*Raleigh, N. C.*
	(Fuller Award)

Baity Principal Dinner Speaker

Not long back from his tour of service introducing and improving sanitation in South American countries, Dr. H. S. Baity, native son and Prof. of Sanitary Engineering at the Univ. of N. C., was chosen to give the principal speech at the annual dinner. He gave an extremely interesting running account of his observations and experiences in South America, but most particularly in Brazil. What added especial interest to his talk were the many excellent lantern slides made from first hand photographs taken by Dr. Baity. The time limit set by the arrangements' committee was far too brief and Dr. Baity's pictorialized account had to be cut shorter than the audience would have had it—but, said Baity, "the dance must go on" and therefore the balance of the slides at some later time.

After seeing the condition of some water supply systems and what little there was in the way of sewer systems, aside from open ditches, one wonders that the mortality and disease rates have been as low as they have.

One of the very interesting features of new sewer construction was the precision with which the trenches are dug and walls finished off. Another was the fact that often women dig the first 3 ft. of trench and men take over the deeper digging.

Vice-Chmn.	**Secy.-Treas.**
J. A. English	*Geo. S. Moore*
Supt.	*Supt.*
Water & Sewerage	*Water & Sewerage*
Salisbury, N. C.	*Albermarle, N. C.*

PROGRAMMERS

Thos. F. Wolfe
Engr.-Director
C. I. Pipe Assn.
Chicago

Robt. E. Stiemke
Assoc. Prof.
N. C. State Col.
Raleigh, N. C.

J. L. Greenlee
Ass't Supt.
Water and Sewage
Charlotte, N. C.

J. M. Jarrett
Chief Engr.
State Dept. Health
Raleigh, N. C.

Stephen R. Kin
Chief San. Engr.
Camp Butner
Durham, N. C.

C. W. Mengel
Prof. Engr.
Wm. C. Olsen
Raleigh, N. C.

"Press" Avery, Rensselaer Distr. Mgr., Atlanta, Ga. | J. K. Marquis, Engr. in Charge Filter & Pump Sta., Spartanburg, S. C. | C. D. Ives, City Engr. & Supt. Water, Asheville, N. C. | Robt. B. Simms, Supt. Water & Sewerage, Spartanburg, S. C. | W. B. Gibson, Sales Engr. Johns-Manville, Jacksonville, Fla. | T. C. Burnett, Supt. Watersheds, Asheville, N. C. | "Ross" Scott, Sales Engr. Dresser Co., New York, N. Y.

Officers Elected

The following officers were elected:

Chairman—
L. I. Lassiter, San. Engr. & Supt. Water Purif., Wilmington, N. C.

Vice-Chairman—
J. A. English, Supt. Water and Sewerage, Salisbury, N. C.

Secretary and Treasurer—
George S. Moore, Supt. Water & Sewerage, Albermarle, N. C.

AWWA Director—*
D. M. Williams, Supt. Water & Sewerage, Durham, N. C.

Trustees—
J. M. Jarrett, State San. Eng., Raleigh, N. C.
P. D. Davis, Cons. Engr., Durham, N. C.

Director to Sewage Works Federation—
Geo. S. Rawlins, Cons. Engr., Charlotte, N. C.

TECHNICAL SESSIONS

"The Development of Water Works Practice in N. C." was the title of the opening paper presented by J. M. Jarrett, Director, Div. of Engineering, N. C. State Dept. of Health. In this paper Mr. Jarrett traced the growth of public water supply in North Carolina from 1919, when the Bureau of Engineering was established and there were 112 public supplies, to the present with 343 such supplies under supervision of the Dept. of Health. Now only 45 N. C. communities of more than 500 population are without benefit of public water supply. In the matter of sewerage facilities only 176 communities had public sewerage systems in 1929 with only 84 treatment plants, as compared to 164 treatment plants in service today. Mr. Jarrett pointed to the need in N. C. of effective stream pollution control measures. He bemoaned the small engineering staff and meager appropriations for a strong staff, but offered all services to N. C. communities possible, hopeful of a better day for his Division and the needed support from the water and sewage works profession of North Carolina, in the matter of securing higher appropriations and adequate personnel.

WATER & SEWAGE WORKS
Executive Secretaries

Harry E. Jordan, AWWA — *Homer W. Wisely, FSWA*

(Interestingly both are natives of Coultersville, a small town in southern Illinois)

"Cleaning of Water Mains in Charlotte" by J. L. Greenlee, Asst. Supt. of Water, Charlotte, N. C.

Mr. Greenlee related experiences in cleaning certain supply mains in Charlotte in 1936 when the friction coefficient on the 24 in. line was brought up to 104 and $3811 was saved annually through power savings in pumping. The cost of cleaning was only $3912 including all charges, labor and material. By 1944 the C value of 104 had dropped to 74 on this same 24 in. raw water supply main to the filter plant from the pumping station. The National Water Main Cleaning Co. was again employed to clean this main after the 8-year period since the first cleaning. In addition some of the larger distribution mains were cleaned as the result of a systematic flow test and survey made by the Pitometer Co. of New York City. The total cost of this 1944 cleaning of the supply main (C=74) was $3461.00 or almost $500 less than the first job in 1936. The power costs were lowered $1200 per year as the result, the lesser saving being explained by the fact that pumps of higher efficiencies (80 per cent wire to water) over a wider head range have replaced the earlier pumps of 50 per cent efficiency in 1936. Likewise power costs have been reduced by about 14 per cent overall since 1936.

As to the distribution mains cleaned the coefficients of 69 to 85 were raised to 115 to 130 on the various mains of 12, 16, 20 and 24 in. sizes. Result has been lowered high pressure pumping head and higher pressures at services during peak draft hours and quicker refilling of elevated tanks following heavy draft hours.

In commenting on obstacles met in these cleaning operations, Mr. Greenlee stated that hand cutting of these larger mains had to be abandoned as too slow and expensive. An electric-arc welding type of cutter was substituted with considerable satisfaction and saving. He explained methods employed to get stopped cleaning units ("go-devils") started on their way again. Some partically closed valves thought to be open completely were found by locating stopped machines. Jointing lead scraped loose by the machine was a particular headache in causing the machine to ride high at the nose and to tend to become jammed at valves. Plugging of services which had not been shut off with scrapings was another difficulty but not serious. Hydrants had to be blown free of scrapings pushed into them.

*Succeeds Wm. Platt, taking office at the close of the 1946 Conf. of AWWA in St. Louis.

Panel on Post-War Problems

W. R. La Due, Supt. Water & Sewerage, Akron, Ohio* | *W. W. Brush, Editor "W. W. Eng." New York, N. Y.* | *H. E. Jordan, Exec. Secy. AWWA, New York, N. Y.* | *L. H. Enslow, Editor "W. W. & S." New York, N. Y.*

*Vice President AWWA.

AWWA Director & Director Elect

Wm. M. Piatt
Consulting Engr.
Durham, N. C.

D. M. Williams
Supt.
Water & Sewerage
Durham, N. C.

An excellent suggestion made by Mr. Greenlee was that of preparing the outlet for the cleaning machine so that the cleaning operations can be watched by as many as possible. Especially should city officials be urged to be on hand for the show. They will be truly impressed, if not amazed, by the quantity of material removed from the line. [That is to say, cleaning of water mains constitutes a good publicity operation, because it is one of the few operations in water supply service which the public can see at first hand and understand. Also, subject to photographic recording, a cleaning operation and what comes out of the line makes excellent material for the newspapers.—L.H.E.].

Homer E. Beckwith who had charge of the surveys by the Pitometer Co. for Charlotte stated that 8 months after cleaning of the distribution mains the C values were practically the same as found 3 weeks after the cleaning. He thought that modern water treatment for corrosion suppression was probably responsible for the sustained C values observed. He also commented on the value of Charlotte's well placed elevated tanks in securing steady flows and pressures.

F. E. Stuart of Stuart-Brumley Corp., told of the modern use of walkie-talkie radio for the control of cleaning machine speed in cleaning the main of Portsmouth, Va. The operation of the control valve was regulated by the cleaning machine follower giving radioed instructions to the valve operator through use of the walkie-talkie sets.

"Fluorescence of Waters as Index of Sewage Pollution" by Ruth McLean, N. C. State Lab. of Hygiene, Raleigh, N. C.

This paper presented by L. G. Maddry of the same laboratory constituted a report on an investigation wherein the fluorescence exhibited by water samples seemed to indicate the degree of pollution of the water by sewage. Investigators in Yugoslavia had observed these phenomena and made use of the rapidly made test for fluorescence as an indicator of the approximate pollution. Urine diluted 100,000 times produces fluorescence whereas if diluted a million times it does not. In the N. C. laboratory the agreement, however, between bacterial findings and fluorescence was none too satisfactory. Decomposing organic matter in general produces fluorescence. An observed 50 points of fluorescence showed only 7% agreement with bacterial results—i.e. E. coli concentrations.

"N. C. Plan for Fluorine Investigation and Control in Water Supply" by Lynn G. Maddry, State Lab. of Hygiene, Raleigh, N. C.

Dinner Speaker

Dr. H. G. Baity
Prof. San. Eng.
Univ., N. C.
Chapel Hill, N. C.

Prog. Chmn.

Geo. Rawlins
Exec. Vice-Pres.
Pease Engrs.
Charlotte, N. C.

After reviewing the fluoride situation in water supply and the present trend toward adding fluoride to public water supply to suppress caries amongst children, Mr. Maddry stated that the State Health Dept. considered the addition of fluorides to water supply questionable practice. The Laboratory of Hygiene is conducting animal feeding experiments in an effort to determine the result of adding fluorides to the diet which might be a more reasonable method of administering fluoride prophylaxis to children than that of wholesale water treatment.

"Present Trends in the Sewage Works Field"—by W. H. Wisely, Exec. Secy., Federation of Sewage Works Assns., Champaign, Ill.

Mr. Wisely's timely review and predictions of things to come in sewage and industrial waste treatment will be published in full in an early issue of *Water Works & Sewerage;* therefore this digest will be on the brief side. He said that in view of the fact that upwards of $1,250,000,000 construction of sewage disposal facilities in America is already in or through the planning stage at this time, it was timely to review objectively present day trends, as this huge undertaking is embarked upon.

Hosts

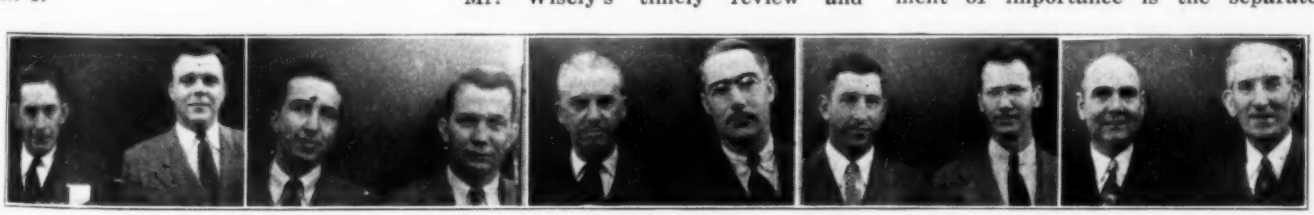
Wm. E. Vest
Supt.
Water & Sewerage
Charlotte, N. C.

*J. R. Purser, Jr.**
Purser Sales
Engineers
Charlotte, N. C.

**Immediate past-chairman, vice-chairman Committee on Arrangements, and pinch-hitting toastmaster.*

The war had been responsible, said Mr. Wisely, for focusing increased interest on sewage treatment and industrial waste treatment. Congress is evidencing great interest in clearing up pollution, the result being the number of anti-pollution bills being studied by committees of Congress. The establishment of sanitary districts as a means of financing and constructing sewerage facilities on an area or water-shed basis decidedly evidences one trend of importance making for sound planning, financing, and management and more adequate salaries to sewage works personnel.

In sewage treatment practice much knowledge and evaluation of processes has come about as the result of sewage treatment at military camps throughout the nation. Short schools in sewage treatment bid fair to be bigger and better to meet operator demands. While there is little that is radically new in sewage treatment processes, improvements have consisted in "high-pressuring" established processes, such as the high-rate trickling filter and the shortened period aeration activated sludge process. In sludge digestion the development of importance is the separate



Ray Odor
Sales Manager
and
Kenneth Burnett
Lynchburg Fdy.
Lynchburg, Va.

"Al" Brumley
Vice-President
and
Cecil G. Haney
Development Engr.
Stuart-Brumley Corp.
Baltimore

Hugo Walker
Office Engr.
and
W. G. Brown
Chemist
Water & Sewerage
Durham, N. C.

J. K. Bailey
Supt. Sewerage
Hampton, Va.
and
C. D. Ives
City Engr.
Asheville, N. C.

Richard Ford, V.P.
Ford Meter Box Co.
Haddonfield, N. J.
and
Forest Taylor
Pittsburgh Meter Co.
Asheville, N. C.

treatment of digester supernatant, permitting heavier digester loadings without operational upsets. There is also a trend toward combinations of treatment processes designed to take heavier loadings and provide greater flexibility in absorbing shock loadings. Many new plants will be especially designed to take variable quantities of industrial wastes in addition to domestic sewage. In such combination plants, chemical treatment may precede the biological processes. In other cases the pretreatment will be given at the industrial plant, but the trend is toward giving the major treatment at the municipal sewage treatment plant with equitable assessment of costs.

In mechanical equipment experience has indicated the need for more rugged and heavier mechanisms, which is the trend in present manufacturing. In the future operators should experience fewer headaches from equipment failures.

The installation of gas engines at smaller treatment plants is anticipated and the dual-fuel engine recently introduced will make more treatment plants completely independent of outside power. It can be expected also that the general use of sewage sludge will expand.

In maintenance, the availability of aluminum and corrosion resistant alloys, at lower prices as the result of war production, can be anticipated. Likewise plastics may well find new applications in sewage plants along with improved protective coatings which have appeared as the result of war production.

Concerning the questions of dual disposal of garbage and sewage, like it or not, sewage plants are to receive more garbage as the result of the introduction of household garbage grinders which discharge to the sewer. Mr. Wisely believes that within the decade ahead 20 per cent of the homes will be equipped with garbage grinders and that sewage plants must be designed to cope with this type of increased loading. Also, does he see a future growth of garbage shredding by the municipality and digestion at the sewage plant in digestors designed for the added loading and with sludge disposal facilities expanded.

Industrial waste is receiving a great deal of attention as evidenced by more than eighty research projects under way embracing forty-six industrial-waste studies. The indications are that industry has seen the handwriting on the wall in regard to stream pollution legislation. Industrial waste treatment is the most pressing of all problems confronting the sewage treatment field; and it is Mr. Wisely's thought that in many cases there must be give and take between sewage works managements and industrial plants, whereby only the essential pretreatment of the waste be given at the industrial plants and provisions be made for extra capacity and special facilities at the sewage plant to handle such pretreated wastes, with the added costs equitably split between the industrial establishment and municipality or sanitary district.

"Advantages of Cement Linings for Cast Iron Pipe"—by Thomas F. Wolfe, Engineer, The Cast Iron Pipe Research Assn., Chicago.

Mr. Wolfe first explained the importance of the much used coefficient of friction referred to as the C value for the pipe in question—a value derived empirically and widely used in connection with the Hazen-Williams formula which was developed about 1905. Starting at 130 for new cast-iron pipe, the C value diminishes with length of service period of the pipe because of advancing tuberculation caused by many waters. The softer the water the more rapid is the loss of pipe capacity. It was to prevent such value diminishing tuberculation that cement lining of cast-iron pipes was started in 1921 through the efforts of J. E. Gibson, manager of the Charleston, S. C., water works who interested the American Cast Iron Pipe Co. in producing such pipe for the Charleston system. Tests made repeatedly over the 23 year period since have proved the value of Charleston's cement linings as evidenced by delivery capacities undiminished during the entire period, although the Charleston water is highly corrosive. With shorter periods of service other cement lined pipe had revealed the same characteristics. Even in connection with waters of non-tuberculating nature, cement linings had been shown to have a higher delivery capacity than tar-dipped pipe.

Illustrating the merits of cement lined pipe, the case of Corpus Christi, Texas, was used. Pumping costs through the 36 in. line 74,400 ft. long would have been $5,160 yearly for 30 year old tar-dipped pipe with a coefficient of 100; whereas with the coefficient of 145 observed on this line the cost of pumping would have remained constant during the 30 year period at that noted during the observed period of service—namely, $2,540 per year. Totalling the average cost of pumping in each case the saving over the 30 years would have been $48,300. Then Mr. Wolfe showed how with increasing daily pumpage the average annual difference in power costs over the 30 year period would have been $8,435. If this saving be capitalized at 4 per cent an investment of $210,875 could be justified to effect this annual saving. This compares with the actual added cost of $40,000 for cement lined 36 in. pipe in a main 17,400 ft. long at present day prices.

In addition to power savings, Corpus Christi would have had to install a heavier weight pipe to withstand the predicted pumping head of 278 ft. for tar-dipped pipe after 30 years' service. Also there would be greater joint leakage at the higher head.

Considering the matter of pipe sizes Mr. Wolfe illustrated an instance wherein an 18 in. cement lined main would be preferable to a 20 in. ordinary tar-dipped main after a 45 year service period in each instance. The difference in pipe sizes permissible in the case of smaller size mains is even more marked than for the larger diameters. This is true because main capacity falls off faster for the smaller diameter pipes when cement linings are not provided. Mr. Wolfe closed by saying that the long physical life of cast-iron pipe means little if the carrying capacity of the main becomes impaired. Therefore, the logical way to prevent such impairment is the use of cement lined pipes in the distribution system as well as for transmission lines.

"Chlorination Terminology" by A. E. Griffin, Assoc. Director, Technical Service Div., Wallace & Tiernan Co., Newark, N. J.

Mr. Griffin reviewed the Ortho-tolidin-Arsenite test for differentiating between so-called "free" chlorine, chlorine in combination as chloramines or allied compounds and false residual chlorine most commonly caused by manganese. He defined as "Marginal Chlorination" the practice of adding just sufficient chlorine to produce residual chlorine of 0.2 ppm. and under without regard as to the form the residual is in—i.e., the process which has so long been practiced in the control of waterborne disease. He defined "chloramination" as the practice of ammonia addition in conjunction with chlorination. He also defined pre-chlorination as chlorination at any point ahead of the filters and post-chlorination as chlorination after filtration. Super-chlorination was difficult to define as it might be anything between the marginal chlorination dosage and chlorination up to the break-point. In defining break-point clorination as chlorination up to the point where all of the residual chlorine is registered by the flash test with ortho-tolidin read within 10 seconds after addition of the reagent, Mr. Griffin stated that in break-point chlorination only free chlorine is found, since amines and ammonia are destroyed.

H. E. Jordan took issue with Mr. Griffin concerning the term "marginal chlorination." To most people marginal denotes border line practice and "marginal" chlorination hardly seemed a fair definition for the long time life saving process that this form of chlorination has been.

Linn H. Enslow rose to support the argument against use of the term "marginal" as applied to the chlorination which vital statistics records had shown to be considerably more than marginal. In other words the records would not support the term as descriptive, in the true sense.

"Cooperative Health and Sanitation in the Americas" by Col. Harold B. Gotaas, President, Instiute of Inter-

American Affairs and Director of Sanitation, Office of Inter-American Affairs, Washington.

Col. Gotaas explained how the Office of Inter-American Affairs works through and with the National Health Dept. of each Latin American cooperating country, which pays the larger part of the cost of maintaining the health and sanitation organizations now operating in 18 countries and involving the services of 200 U. S. employees and 12,000 native employees.

He described the poor sanitary conditions and said that the reason therefor was the lack of sanitary engineers as compared with doctors, and poor economic conditions of the municipalities. As a rule water mains are inadequate for fire protection and that service is of the on-and-off variety because of general lack of metering and the enormous water loss through leaky household facilities. Cooperative public supplies have been installed in 63 communities with slow sand filters providing purification in the majority of instances as the most practical and economical method.

Programmers

W. M. Lybrook
Supt.
Public Services
Greensboro, N. C.

E. H. Moss
Supt.
Sewage Treatment
Greensboro, N. C.

Sewerage facilities are in worse condition than water supply, but improvements are still some distance in the future. In Santiago, Chile, sewage is to be used for irrigation of 30,000 acres. Garbage is disposed of by the land-fill method which has been very satisfactory.

Immediate Post-War Problems

(A Panel Discussion)

A panel discussion held on "Immediate Post-War Problems" was participated in by W. R. La Due, W. W. Brush, H. E. Jordan, W. H. Wisely, and L. H. Enslow—

Mr. Brush, confining his remarks to the distribution system, emphasized the importance of increasing care and maintenance of valves and the need in the majority of systems for more valves to permit quick positive shut off of main breaks. He pointed to the need for valves designed for quicker closing and positive shut off. A damper type valve might be the proper sort to attain both objectives. Every hydrant branch should have a valve kept in good order. As to water mains he favors the two-main system and advocated the use of cement lined pipe only in all future main extensions, new mains and replacements. He felt that considerable could be done in the direction of improving the comfort and

"Registrationists"

Anna V. Bolton, Charlotte Water Dept.
Ethel Godwin Young, Raleigh Water Dept.

safety of water works personnel, especially the emergency crews. While proof of negligence is necessary in bringing suits for damages against a water department or its employees, Mr. Brush advocates the carrying of insurance by all water utilities to cover losses to the public resulting from water damage.

H. E. Jordan confined his remarks to the matter of surplus property distribution and how water utilities will probably fare in getting some of the surplus. At the time, however, matters were in such a state of flux regarding surplus property distribution to municipalities that there was little concrete advice to give. At later meetings Mr. Jordan had considerably more to report on surplus property.

W. H. Wisely thought short schools in the sewage works field to be one of the more important considerations amongst post-war activities. ABC courses were particularly desirable in connection with operator licensing, which continued to be a highly desirable objective in improving the quality of plant operation and the status of operators. He pointed to the success of the licensing plans of Texas and Michigan. He also directed attention to operator correspondence courses of the Missouri Water and Sewage Conference conducted by the Univ. of Missouri. Mr. Wisely also called attention to the potentialities of supervision of a number of small plants by licensed operators of larger plants in areas contingent to the plant of these advanced operators. This method of securing higher-grade operation had been shown economically advantageous to the small community as well as the supervising operator, and was favored by state sanitary engineers. He urged wider adoption of this method.

U. S. Engineers

Capt. A. Lund
Water and
Sewerage Section
4th Service Comm.
Atlanta, Ga.

Maj. D. R. Taylor
Chief Water &
Sewerage Section
4th Service Comm.
Atlanta, Ga.

L. H. Enslow in the matter of post-war thinking urged greater attention to distributed water storage on the system through wider use of elevated tanks, or ground storage with automatic pumping. He cited Charlotte, N. C. and Spartanburg, S. C., as nearby illustrations of strategically located distribution system storage.

As regards water treatment, taste and odor control remained one of the principal problems and especially needed were methods of pre-determining what type of treatment to employ and when to place it in operation to avoid missing the first wave of objectionable water which so frequently gets through to the mains before detection. Corrosion control ranked along with taste control, remaining an incompletely solved problem. Chemists had still to study and perfect methods of corrosion control which would satisfy all conditions. Until such time as more dependable and more universally effective treatments have been perfected, Mr. Enslow advocated dependence on lined pipes and non-corrosive materials in the distribution system, and for service lines and piping on the customers' premises as well.

Programmers

A. E. Griffin
Devel. Engr.
W. & T. Co.
Newark, N. J.

R. D. Farrell
Chief Engr.
State Dept. Health
Nashville, Tenn.

Mr. Enslow then pointed to one of the most important post-war problems —that recently taken up by the AWWA—namely, the question of improving public relations in the water utility field. Experiences in the early stages of the war and the priority system evidenced the little appreciation by the general public of the true importance of public water supply. To correct this situation, water utility managers must go in for more attention to publicity and education of the general public. AWWA is studying means and methods of advancing recognition of American water utilities; but little can be done unless the water works fraternity becomes "sold"

on the true advantages of making the results of their endeavors better known and thus receive the deserved recognition, thereby profiting thereafter through the advanced economic status which will follow as a natural course of events when the water utility becomes better appreciated. Of all of the post-war problems, this problem he would pick as of top importance to the profession as a whole.

W. R. La Due, vice-president of AWWA, made a stellar luncheon address as a part of this discussion of post-war problems. He explained the slowness of getting planned post-war projects, in the amount of $200,000,000, under construction. Not the least has been the uncertainty in the labor market, which has been responsible for contract bids 25 per cent to 50 per cent above planning estimates and even the unwillingness of contractors to bid on projects at all. Then, too, there is the continued hope by many municipal authorities that delay may be rewarded by some form of Federal aid for public works. Slowness of release of personnel by the armed forces has been another cause of delay in completing plans and specifications. Increased cost of equipment and materials and uncertainty of supply has been the least cause for delay.

Mr. La Due pointed to this as the proper time to reverse the course of doing as little as possible in maintenance and replacements and to turn to fundamental thinking, to planning and to action. He stressed the value of using the AWWA Check List in going over water plants and equipment from cellar to attic.

In the matter of improving the status of the water utility, Mr. La Due said that obsolescence of personnel was an important consideration and that membership in AWWA was the best method of preventing such obsolescence. As to the need for improving public relations, Mr. La Due emphasized what the results could be, and lamented the fact that so few water works men, as good as they are, are courageous enough to appear before the public in their true light. It is really due them and their employees to assume a different viewpoint in respect to publicity values and to overcome their reticence to remove the well known bushel and see to it that the true light of the water utility shines in their community.

[We regret that the limitation of five pages to this report prevents the reporting of the two last papers on the North Carolina program—"Stream Pollution Control in North Carolina" by Casper Maynick of the N. C. Stream Conservation Committee, and "A Discussion of Similar Work in Tennessee" by R. D. Farrell, State Sanitary Engineer of Tennessee. Neither can the round table discussions on water and sewage works problems be reported, a situation which we regret very much. —L.H.E.]

Virginia, West Va. and Florida Reports in January

In November a large number of meetings were held, three of which are reported in this issue.

We regret our inability to include in this issue reports covering three of these November meetings. The reports covering the meetings of the Virginia, the West Virginia, and the Florida Sections of AWWA, however, will appear in our next issue.

HUDSON FALLS MEETS SCUM, HEAD ON!

By J. A. FITZGERALD, Supt.
Sewage Treatment Plant
HUDSON FALLS, N. Y.

HUDSON FALLS, N. Y., has a primary sewage treatment, with separate sludge digestion, serving a population of 7,000. Until December, 1944, no particular operating problems had occurred but in that month the Hudson Falls Sewage Treatment Plant ran head on into a severe scum problem in the digestion tanks.

The Author

Two stage digestion is employed, the first stage tank having a fixed cover and central mixer, while the second stage tank has a floating cover. Sampling from the sample pipe did not indicate any scum formation but suddenly the overflow line from first stage to second stage began to plug, and snow on the roof of the first stage tank failed to melt.

Removal of a manhole cover confirmed the suspicion of scum approximately a foot thick. Jetting of the mass by using high pressure nozzles inserted through the manhole and through the openings for two "Varec" pressure reliefs that were removed, succeeded in breaking up the mass. Eighteen hours later the scum mat had reformed as stiff as before.

Taking Out the Scum

There was nothing left to do but remove the scum and with the help of but one available extra man and at the expense of aching backs and muscles, this work was started on Dec. 7th and completed on December 11th. Garden rakes and a potato hook with one-half-inch mesh wire screen wired to the face of the rake teeth proved to be the most practical tool for this work and the solids were dumped onto the ground in three piles around the tank, to be removed in warm weather.

The absence of a fourth opening or manhole proved to be a decided handicap as it was very difficult to reach the piled up mass in the area where no opening existed but with a hook at the end of a long pole and with much muttering and cursing we did finally succeed in bringing the mass around to one of the other openings. Approximately 600 cu. ft. with an estimated weight of sixteen tons of top sludge were removed.

Analysis of Scum

Samples were taken before and after the high pressure jetting. Samples were also collected of light and dark colored scum. The results of the analyses were as follows:

SAMPLE	Constituent—Dry Solids	Volatile Matter
Light colored scum before hosing	24.5%	45.3%
Dark colored scum before hosing	25.9%	48.6%
Scum 18 hrs. after hosing	11.3%	63.7%

A chloroform extraction of the dried scum showed 8.4 per cent mineral oil. Hudson Falls has no industrial waste and it must be assumed that the mineral oil comes from garages, filling stations, or individuals who dump waste oil into sewer outlets.

Two months after the experience with scum in the primary digester, there was every indication that the second stage tank, too, had a layer of scum.

As a result of this experience with scum in digesters, the writer has come to the conclusion that:

(1) Ordinances should be enacted to minimize the discharge of oil to the sewers.
(2) Scum must be removed when it interferes with tank operations.
(3) High pressure hosing does not correct the scum conditions.
(4) At least four manholes equally spaced should be provided in tank covers to facilitate scum removal or repairs.
(5) Designing engineers and equipment manufacturers should give more consideration to operation of sewage works equipment in sub-zero weather.

PRESTRESSED REINFORCED CONCRETE PIPE*

A Description of Its Manufacture and Discussion of Its Merits

By F. F. LONGLEY
Vice President
LOCK JOINT PIPE COMPANY
EAST ORANGE, N. J.

A DISCUSSION of prestressed reinforced concrete pressure pipe needs a certain perspective. It can be very well introduced by relating a series of steps in the development of reinforced concrete pressure pipe that have had their part in leading up to present day design.

The Author

No great ingenuity or skill is necessary to build two concentric forms of short length and pour concrete between them, thus forming a concrete pipe. That was no doubt the beginning of the concrete pipe industry. There is still no great ingenuity or skill needed to place a cage, made of steel, between these forms and thus produce a short reinforced concrete pipe.

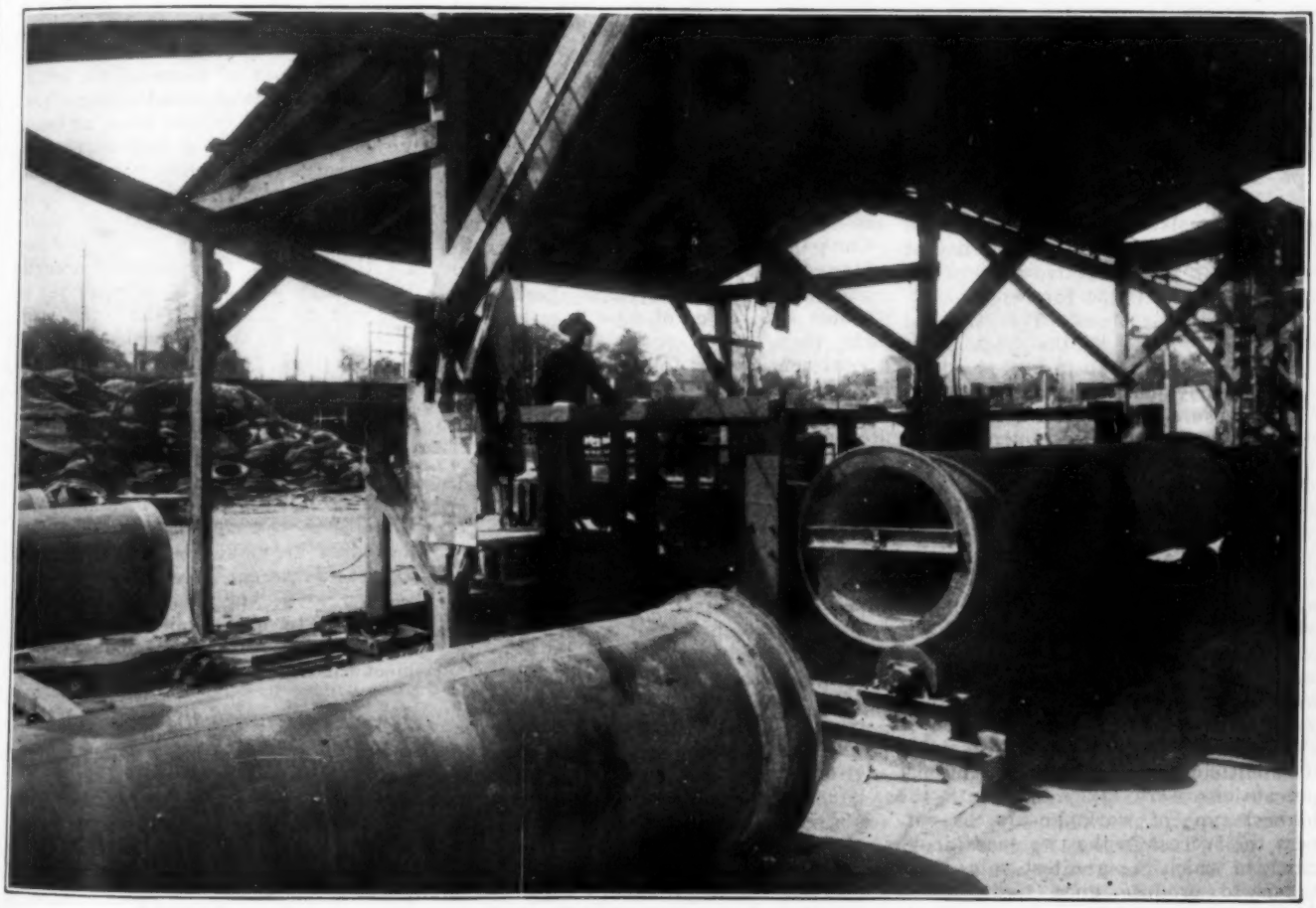
At the beginning of this century, that was about the state of the art in America. Concrete pipe and reinforced concrete pipe were being made and used, with growing appreciation of their merits, and also with a growing accumulation of helpful facts regarding design and regarding the supporting capacity of this pipe for external loads. The field of usefulness for concrete pipe at that period was mainly sewers, drains and culverts. The idea of using it for the construction of pressure pipe lines was at that time only in a budding stage. There is evidence that Europe was a little ahead of the United States in the development of reinforced concrete pressure pipe, as early installations in the City of Paris were made in the early 90's.

Earliest Adaptations of Concrete Pipe in Pressure Conduits

In 1909 the City of Toronto commenced to build a filtration plant of the slow sand type. This called for the use of 5,000 or 6,000 lineal feet of 72-in., 54-in. and 36-in. conduit to carry water to and from the filters and the reservoir. These conduits were to operate under slight internal pressure. This pressure was not much, but enough to class this work definitely as a light head pressure pipe.

The writer was resident engineer on that work. Toronto's engineering advisers were well impressed with the arguments favoring the use of reinforced

*Presented before the 64th Annual Meeting of NEWWA at Boston, Mass., Sept. 11, 1945. Released for publication in *Water Works & Sewerage* by the Editor of the Journal NEWWA.



Fabricating Prestressed Steel Cylinder Concrete Pipes for Washington Suburban Sanitary District
(On left is steel jacketed concrete pipe core ready for tension winding with wire, this operation being under way for the rotating machine under shed.)

concrete pipe for this purpose, and after some study the decision was reached to use it, and an order was given to the Lock Joint Pipe Company for this pipe. The concrete pipe that could be furnished at that time was what would now be classed as sewer pipe. The utmost pains were taken in the laying of this pipe and in the making of the joints. The plant was put in operation and these light head concrete pressure pipe lines were entirely successful and have operated without trouble through a third of a century. It is logical to refer to this as one of the early steps in progress towards the highly effective pressure pipe of today.

Again, only a few years later, the Water Supply Board responsible for wholesale supply for the cities of Salem and Beverly, Mass., had a project which involved a force main to carry some of the flood waters of the Ipswich River into Wenham Lake. Here Malcolm Pirnie and the writer were associated on the engineering work, and with a conviction that a conduit of concrete would be very effective, a contract was awarded for the construction of this force main with reinforced concrete pipe, which again was furnished by the Lock Joint Pipe Company. This Salem-Beverly pipe line was partly 48-in. and partly 36-in. diameter, and was designed to operate under a head, near the pumping station, of about 20 feet. The water was delivered through it with electrically operated centrifugal pumps. The line was put in operation and has served well ever since.

Here, then, are two early cases in which the writer was involved as engineer and the Lock Joint Pipe Company as the furnisher of reinforced concrete pipe to operate under internal pressure. I think I am safe in saying that all those involved in these jobs gained a vivid impression of the possibility of developing a very effective type of reinforced concrete pipe for construction of pressure pipe lines. This thought was coming home to the Lock Joint Pipe Company with special emphasis.

These early jobs, of course, were for light pressure. No one at that time would venture to build concrete pipe lines for high pressures. But the seed of reinforced concrete pressure pipe was now well planted. Other opportunities came quickly. Along with opportunities came a realization of shortcomings, one of the chief of which was the joint. In the pipe then being made, which today one would refer to as sewer pipe, having concrete surfaces at the ends, the only way to make the joint was by filling the joint space with cement mortar.

This could be done fairly effectively if conditions were right, if the utmost precautions were taken, and with the highest type of workmanship, as witness the success in the two cases above cited, in which the greatest pains were taken to produce good tight joints. Such a mortar joint can not be made well if the concrete is too dry, nor if it is too wet. Nor can it be made well if the concrete is too hot, nor if it is too cold. For quantity production under the average field conditions, the mortar joint placed against concrete surfaces left a great deal to be desired and could not be relied upon for a satisfactory degree of water-tightness.

An Improved Joint Developed

This resulted in the pipe joint coming in for a lot of attention at an early date, and in due time this problem was solved and the joints now in use by the Lock Joint Pipe Company, which are today so well known to water works engineers, constituted a major improvement, and formed an exceedingly important factor in the development.

In addition to the pressure joint improvements just referred to, carrying capacity has been the subject of much study and various improvements made, with a result that now it can be confidently predicted that the carrying capacity of our concrete pipe lines will be found in the very highest range.

Economy is a topic for constant study, and the number of improvements that have been made for better economy is very large. Unfortunately, at present, labor cost has risen sharply again, due to increased labor rates, labor shortages, and the numerous labor difficulties we now have to struggle with.

Ability to carry external loads comes into many a problem and various improvements have been made with a view to bringing that feature to a high degree of perfection.

And Now—Prestressed Pipe a Further Advance

With these and many other improvements over the past thirty years or so, it is evident that the Lock Joint Pipe Company believes thoroughly in a constant effort to improve its products; and notwithstanding the fact that scores and scores of pipe lines built in the past decade or so, for the most vital service and for the most discriminating engineers, have given complete satisfaction, and might therefore be considered to be perfect, the writer's company has kept ever before itself a high goal of perfection, and the development of prestressed pipe is one of the natural results.

Let us not think of prestressed pipe as something new. The principle of prestressing steel in tension and concrete in compression is old and well known, but it can be said that its application to the manufacture of pipe is quite recent. The reason for this is, no doubt, that only recently have effective methods and equipment been devised to produce prestressed pipe satisfactorily and economically. There are a great many patents reposing in the archives of the patent office, relating to the prestressing of steel in tension and concrete in compression. Many are so old that they have expired. Notwithstanding that, the examples of engineering structures involving this principle are few in type and few in number, and until quite recently, none at all in the field of pressure pipe manufacture.

Today, prestressed pipe is being made and used with entire success. The Lock Joint Pipe Company, as well as others, have devoted years of time and much patient effort to the development of commercially feasible methods for its manufacture. And again let me emphasize that we do not need to regard it as something new, and therefore of doubtful efficacy. All the essential elements of old and well proven pipe design are there; the steel cylinder (excepting in pipe for the lighter range of pressures), the joint rings and gasket, well known and well proven, the cage of steel supplementing and surrounding the steel cylinder, and the dense, rich concrete envelope within and without. The improved feature is merely that the cage is made of steel wire of high tensile strength instead of steel bars or rods of normal structural strength, and this wire is placed in the wall of the pipe under a high initial tension, with a consequent initial compression in the part of the pipe wall lying inside of the tensioned wire. [See drawing of section through pipe wall and joint; also photo of wire winding operation.]

One reason, we have gathered, why some prospective customers have shown a degree of reluctance in adopting prestressed pipe, is that they suspect that dimensional changes can occur in the core which might result in a reduction in the length of the prestressed circumferential wire, and a consequent loss of some of the initial wire stress. Dimensional changes can, of course, occur in the core, although they are admittedly of only microscopical magnitude. The first point to make in this connection is that even if these small dimensional changes do occur, without anything being done to counteract their effect, the bursting strength of the pipe will not be affected (as is referred to later on), and the main effect would be that the range of internal pressure, within which the pipe would behave as a true elastic structure, would be less. The second point to make is that both in European practice, which we have investigated, and in our own practice, the possibility of these microscopical dimensional changes in the core is recognized and measures are taken to anticipate this, and to counteract its effect by boosting the stress at the moment of winding the wire to the extent of something like 20% over the stress computed to meet the design conditions.

How Prestressed Pipes Are Made

Lock Joint prestressed steel cylinder pipe is made as follows: The welded steel sheet cylinder, with joint rings attached, is made and tested under internal water pressure, just as has been done for years in the manufacture of steel cylinder pipe. The cylinder is then lined with concrete to a pre-determined thickness. This may be done either by casting in a vertical mold, or spinning centrifugally. This lined steel

cylinder constitutes what is termed the "core." After curing, the core is ready for the tension winding. It is rotated in a machine and the wire wound upon it helically. (See photo.) The end of the wire is held firmly attached to one of the joint rings. It is then put under a constant and uniform sustained tension, fixed by the conditions of design. The movement of rotation and of axial translation are under mechanical control, and can be fixed to meet the conditions of design. Where the helix terminates on the other joint ring, the wire is again firmly attached.

The pipe is now complete except for the outer envelope of cement mortar. The pipe is rotated and the coating machine is moved longitudinally in front of it, and the mortar, premixed and very low in water content, is hurled against the outer surface of the pipe at a velocity of about 80 feet per second, building up a remarkably dense and resistant envelope to a depth of ¾-in. The pipe is then again placed in curing bins.

Continuing the thoughts above expressed regarding "improvements," it is pertinent to remark that the several essential steps in the manufacture of prestressed cylinder pipe, especially the making of the cores, the stress-winding of the wire and the finish envelope of cement mortar, required special machinery, all of which we developed ourselves, and these have been constantly studied and improved to assure a high degree of efficiency and dependability.

Reasons for the Steel Cylinder

For most of the pipe line jobs that we do in prestressed pipe, we prefer to make the pipe with a steel cylinder. In view of the fact that some pipe lines have been built recently of prestressed pipe without a steel cylinder, it seems worthwhile to develop this idea somewhat.

Let us consider for a moment the pipe we have been making for years, not prestressed. We have built endless miles of steel cylinder pipe lines for pressures ranging as high as 250 lbs. sq. in. and have been able to sleep nights with little or no concern about leakage. This we could not have done with equanimity had we not built a steel cylinder into the pipe wall.

We have also built pressure pipe lines without a steel cylinder. That was the way we started building them many years ago. In those early days the work we were permitted to do was for relatively low heads. We still build pipe lines without a steel cylinder where the internal pressure lies within a limit which is appropriate for the wall thickness and other conditions. There are many pipe lines falling within this category, and there is a definite place for non-cylinder concrete pressure pipe. In a large percentage of the water works jobs in this country, however, the operating pressures are high enough to call for the use of steel cylinder pipe.

In a general way, we have been in the habit of thinking of 50 ft. to 75 ft. as a comfortably safe limit of head for cast concrete pipe, non-prestressed and without a steel cylinder.

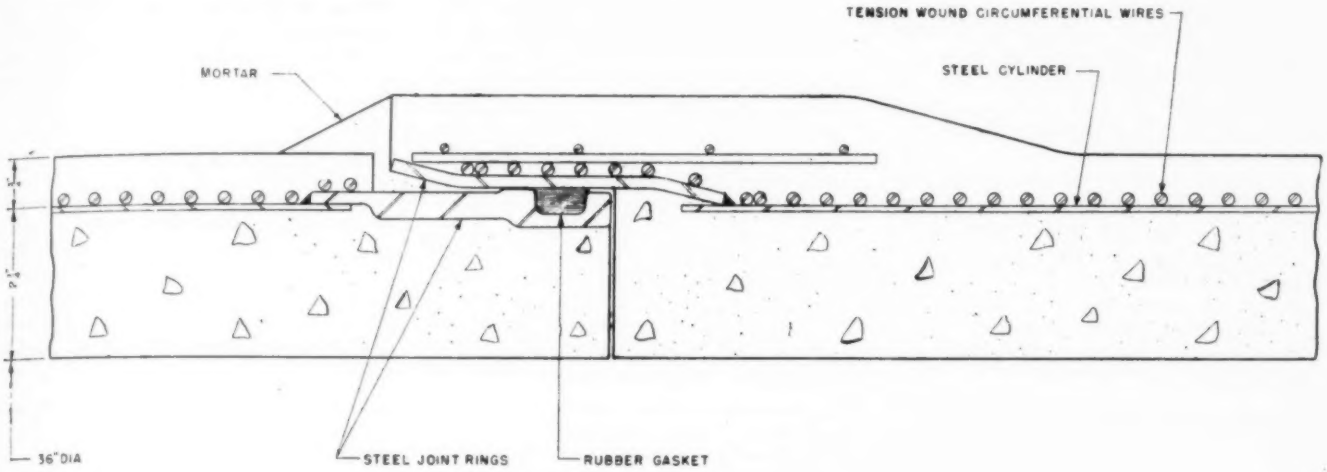
Now let us turn to prestressed pipe. Broadly speaking, it may be said that a steel cylinder should be used in prestressed pipe designed for the higher range of pressures, but that it can be dispensed with in prestressed pipe designed for the lower range of pressures. We had better beg the question at the present time as to what is the pressure limit that divides these two. There is too little evidence from experience to date to serve as a basis for any generalization on this point, and generalizations are rarely safe, anyhow.

It may be of some significance to note that, while the highest internal pressure for which we have thus far built a steel cylinder concrete pipe line, not prestressed, is 250 pounds more or less, now we can easily build prestressed pipe for twice that pressure. And while we generally limit the internal pressure in non-prestressed pipe without a steel cylinder, to something like 75 feet, some evidence has shown that a head limit twice as great as that, or perhaps somewhat higher, would be satisfactory for prestressed pipe without a cylinder.

A prestressed pipe line without steel cylinder was built in Chicago a few years ago, and was described in the October, 1943, issue of the Journal of the American Water Works Association, and also in *Water Works and Sewerage* for October, 1943. The operating pressure this line is intended to serve is stated to be about 37 pounds, though it was subjected to a test at 100 pounds. This job reflected great credit upon those who built it, and reflected, also, no doubt, a lot of painstaking attention on the part of the pipe manufacturer and a combination of favorable materials and manufacturing conditions. Experience with the manufacture of prestressed pipe without steel cylinder has indicated that it is well suited for pressures up to a medium range, but that there is need for a discriminating judgment as to the limits of internal pressure for which it should be used.

The prestressed pipe that the Lock Joint Pipe Company has been building, all of which has been for high pressures, has been built with a continuous watertight cylinder of steel sheets. In the course of fabrication of the steel structure of the pipe, this steel cylinder is tested for tightness in all its welded seams, and we can therefore count upon water-tightness of the pipe wall at high pressure. By this means we can be quite confident of being able to produce a pipe line that will meet every criterion of satisfaction at high pressures.

In pressure pipe that is not prestressed, the use of the steel cylinder



SECTION THRU JOINT

Section Through Rubber Gasketted Expansion Joint and Wall of Prestressed Concrete-Steel Pipe

fits in with perfect logic, since it is in tension and carries its proportional share of the load. In discussing the design of prestressed pipe, however, we are now and then faced with the question whether the steel cylinder is a logical and necessary feature because it forms part of the compression core of the prestressed pipe, that is, it is under compression rather than tension throughout the customary range of operating pressure.

The answer to this is clearly "Yes"—the steel cylinder is a logical and necessary feature of prestressed pipe for the range of pressures for which it is commonly used. It is a fact that this element of steel is in compression in the pipe as manufactured and ready for use, but when the pipe is full of water and interior pressure is increased the tension in the steel wire increases, and the compressive stress in the concrete and in the steel cylinder diminishes. A point is reached in the increasing pressure where the compressive stresses in the concrete and in the steel cylinder reduce to zero.

As long as any compressive stress remains in the core, the circumferential elongation of the pipe wall under increments of increasing pressure is governed by the combined characteristics of the steel and the concrete, which are firmly and intimately bound together by the prestressing wire. When the increasing pressure reaches a point that causes the compressive stress in the core to reduce to zero, and passes it, the concrete will have lost its tendency to increase its dimensions further and presumably will lie inert, and from that point upward to higher pressures the wire and cylinder will both be in tension, and the circumferential elongation of both will then be governed by the characteristics of steel alone.

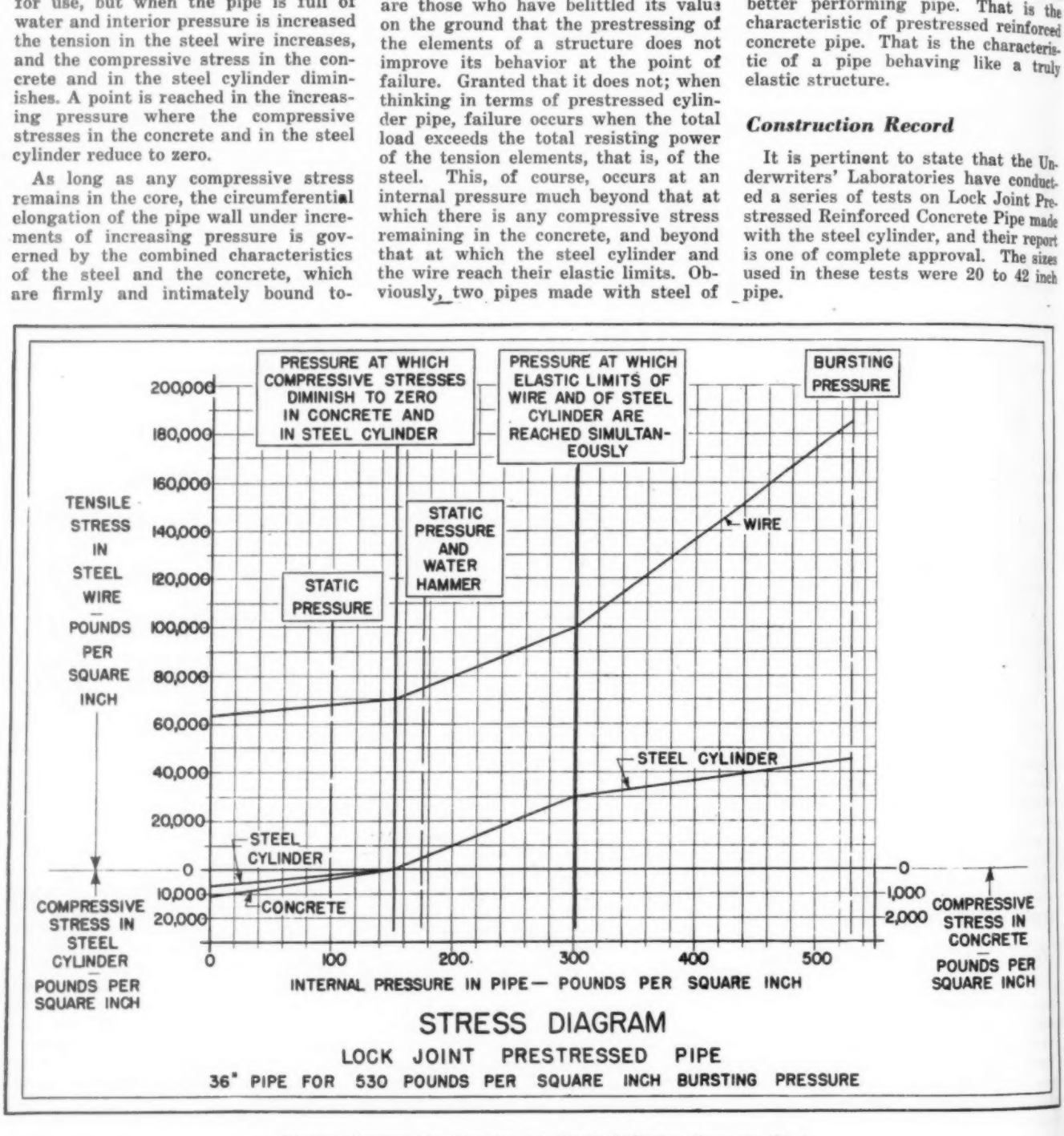
What About Possibilities of Failure?

In discussions of the prestressing principle in technical literature, there are those who have belittled its value on the ground that the prestressing of the elements of a structure does not improve its behavior at the point of failure. Granted that it does not; when thinking in terms of prestressed cylinder pipe, failure occurs when the total load exceeds the total resisting power of the tension elements, that is, of the steel. This, of course, occurs at an internal pressure much beyond that at which there is any compressive stress remaining in the concrete, and beyond that at which the steel cylinder and the wire reach their elastic limits. Obviously, two pipes made with steel of equal total resisting power will reach the point of failure at the same internal pressure even if one is prestressed and the other is not.

The point of failure is not the only thing we are concerned with, nor is it the important thing we are concerned with. We are interested primarily in the behavior characteristics of the pipe within the range of pressures in which it is designed to operate, including an allowance for abnormal pressure rises such as water hammer. If, within that range of pressure, we have a pipe whose circumferential variations in dimensions are governed by identical relationships between stress and strain in the steel and in the concrete, instead of differing relationships, we have a better performing pipe. That is the characteristic of prestressed reinforced concrete pipe. That is the characteristic of a pipe behaving like a truly elastic structure.

Construction Record

It is pertinent to state that the Underwriters' Laboratories have conducted a series of tests on Lock Joint Prestressed Reinforced Concrete Pipe made with the steel cylinder, and their report is one of complete approval. The sizes used in these tests were 20 to 42 inch pipe.



Stress Diagram for Prestressed Steel Cylinder Concrete Pipe

The pipe lines thus far built with this pipe include the following:

Location	Size (Inches)	Approx. Length in Feet	Design Pressure Pounds
Norfolk, Va.	20	22,000	100
Norfolk, Va.	20	13,000	100
Pennington, Va..	20	20,000	300
Washington, D. C.	20	2,500	150
Climax, Colo. ..	20	2,000	250
Hyattsville, Md.*	30	50,000	150
Washington, D. C.	30	14,000	120
Washington, D. C.	30	11,000	150
San Juan, P. R.	36	47,000	200
San Juan, P. R.	42	23,000	110
Bethlehem, Pa...	34	10,000	...
		214,500	

*Wash. Suburban Sanitary Distr.

In addition to the desirable elastic quality, above referred to, this pipe is of lighter weight, is stronger as a beam, and is stronger to resist external loading, than a corresponding design of the older steel cylinder pipe.

Concerning the Pattern of Stresses

An idea of the stresses in the several elements of prestressed steel cylinder pipe, and of the changes that take place therein with changes in the internal pressure, may be quickly grasped from a study of the typical pressure-stress diagram shown herewith.

When the pipe is made, the wire is wound under tension upon the outer surface of the core, which consists of the welded steel cylinder lined with concrete. The wire is given a high initial stress and this, of course, induces a compressive stress in the core, in both elements thereof—the concrete core and its steel jacket. The product of the area of the wire by its unit tensile stress is equal to the sum of two products, the area of the concrete by its compressive stress, plus the area of the steel cylinder by its compressive stress. In each case where "area" is thus referred to, it means the area of that element in a lineal foot of cross section of one pipe wall, cut by a plane passing through the pipe axis.

In the pipe at rest, that is, with zero internal pressure, the stresses in wire, cylinder and concrete are as shown on the vertical line through zero pressure. Here it may again be well to emphasize the point that the three elements —wire, steel cylinder and concrete lining—being fabricated under stress into a single unit in stress equilibrium, are forced to change their dimensions in identical amounts when subjected to load. Thus, when the pipe is filled with water and the pressure increased, the elongation of the wire and of the steel cylinder proceed at equal rates, and the two lines representing this on the diagram are parallel. The wire is increasing in its tensile stress, and the steel cylinder is decreasing in its compressive stress, but at equal rates. The concrete, also, is decreasing in its compressive stress, at the same dimensional rate, though at a different stress rate. The stresses in the three elements at any given internal pressure in the pipe may be determined from the equilibrium that exists between the interior water pressure and the condition at that time of the three elements, governed by the equilibrium initially established among them when the interior pressure was zero.

As the internal pressure is increased, these closely related changes in stresses in the three elements proceed. A point is reached in the increasing internal pressure when the diminishing compressive stresses in the concrete lining and in the steel cylinder become zero. At that moment, as well as before, the wire is carrying the entire load resulting from the internal pressure, and the core of concrete lined steel cylinder, having just lost all of its initially induced compressive stress, is for the moment "in neutral."

In testing a pipe to destruction, the internal pressure is, of course, carried way above any pressure that is ever likely to come upon a pipe line in service. If the pressure is increased beyond the point where compressive stresses in the core reduce to zero, the concrete may be considered as carrying none of the load of internal pressure, but it is all carried by the wire and the steel cylinder, both now in tension. The computation of stresses corresponding to internal pressure now becomes simpler, because there is no longer the complicating factor of a diminishing compressive stress in the concrete. The rates of stress increase in the wire and cylinder are equal and directly proportional to rates of pressure increase, and the lines representing this relationship on the diagram are parallel.

This continues until the increasing internal pressure reaches a point corresponding to the elastic limit of the wire and the steel cylinder. These are reached simultaneously as one of the conditions of design. The wire, having a much higher elastic limit than the steel cylinder, commences to carry the entire load, accompanied by a ductile yielding or elongation of the steel sheet. Then, as the internal test pressure is carried still higher and approaches the point of failure, the circumferential enlargement becomes conspicuous, and finally, with a sharp report, a number of coils of the tension wrapped wire pencil out and break.

The concrete cover ruptures and comes off in fragments over the area of the broken wire. The steel cylinder, already well beyond its yield point, thus relieved of external support of the wire, bellies out.

The lines on the diagram showing the variation in stresses in the steel cylinder and the wire are parallel up to the pressure at which they both reach their elastic limit. Beyond that they are no longer parallel, but to the point of pipe failure they follow directions governed by their separate physical characteristics.

Reinforced concrete steel cylinder pressure pipe, not prestressed, has long been recognized for its numerous advantageous qualities, its great durability, its high and enduring carrying capacity, its excellent joint and consequent water-tightness, its economy. But prestressing has added considerably to the economy of the pipe, and also in an important degree to its elastic qualities. In this prestressed pipe we have a pipe that is truly elastic throughout its usual range of pressures. This quality in reinforced concrete pipe constitutes a real advance in the art.

Grand Canyon Lifts Water 3400 Ft. to South Rim

(A Correction)

Guess it behooves the editor of *W.W.&S.* to keep better informed on water supply developments. At the end of the item on page 304 of our October issue describing a "Scheme for Preventing Tank Risers from Freezing Up," our ed. note commented on the high value of potable water at Grand Canyon, Ariz., because this entire supply had to be hauled in by tank cars especially maintained for the purpose. Further, this expensive water is reclaimed from the combination activated sludge-mechanical filter plant for reuse in many applications when the new water is not essential.

From G. L. Davenport, Hydraulic Engineer, Santa Fe Lines, Los Angeles, comes an objection. Mr. Davenport says that the comment on water reclamation and re-use is still correct, but the statement that all new water is hauled in by tank cars is inaccurate.

The Santa Fe Railroad has installed a pumping plant at Indian Gardens more than half way down the walls of the mile-deep Grand Canyon, involving the use of steel pipe resembling the big-guns of World War II because of its thickness of wall. The heaviness of wall is required because of the single lift pumping from the crystal spring 3400 ft. to a storage tank on the South Rim of the Canyon.

Mr. Davenport has agreed to prepare a brief article for *W.W.&S.* describing this unusual water supply system which, notwithstanding the high costs for piping and pumps required, has paid out handsomely when compared with the two-way travel of the Santa Fe's special water cars.

Parkhill, Smith & Cooper Form Consulting Firm

A recent announcement from Lubbock, Texas, tells of the formation of a new consulting engineering firm. Messrs. G. W. Parkhill, M. R. Smith, Jr., and S. C. Cooper have formed a partnership for the practice of Civil Engineering under the firm name of Parkhill, Smith & Cooper. Their office is located at 210 Sanford Bldg., 1009½ Texas Ave., Lubbock, Tex.

CHINESE TAKE OVER WATER SYSTEMS FROM JAPS

A Letter From Col. Morrill in Tientsin, China

DEAR DOC: When you were a little feller, maybe in primary school, I lived for three years in this town of Tientsin teaching surveying, sanitary engineering and such, to Chinese young men. And, last Tuesday (Oct. 2) I came back, flying in from Chungking with a party of seventeen, mostly city officials, and all Chinese, but me!

Col. A. B. Morrill USPHS

Maybe Chungking and Tientsin are just two other places in China to you, but here it makes a lot of difference which one you are in. They are only 901 miles apart by air, but Chungking, in the mountains, is the rather primitive, overcrowded, struggling capital of wartime China. And Tientsin, in spite of eight years' occupation by the Japs, is a great seaport in the coastal plain, with fine buildings, elevators, street cars, a good hotel, a hot bath in a modern bath tub, and a delicious and tremendous dinner in the Bankers' Club.

When we arrived there were still plenty of Jap soldiers running around, most of them armed, but quiet and peaceful. They were still guarding the main water plant when we went to look it over, I suppose by arrangement with the American commander. The formal surrender of the forces in the Tientsin area did not take place until last Saturday, Oct. 6.

Water System Surrendered

But the real dramatic function, at least from the point of view of *Water Works & Sewerage*, took place this afternoon (Oct. 8), the surrender of the water system of the Japanese concession. It has a population of 50,000 or 100,000 and is entirely surrounded by Chinese territory and by foreign concessions that have now reverted to the Chinese government. The Japanese took their water from the general city supply (operated by a private company), through six master meters at their boundary. They read the 4000 consumers' meters, submitted bills, and collected the money, through a sort of municipal organization which also handled the electric supply, public works, and other matters.

At the party this afternoon there were five Japs, nine Chinese, a British waterworks man just back from two and a half years' internment, and I. The Jap general manager looked rather glum and the old water engineer solemn, but the other three Japs looked cheerful; in fact, the electrical section chief was almost jolly. There was no spitting in the Japs' eyes, but quite a lot of bowing on both sides. The Japs seemed to be handing over all technical information asked for without any reserve at all.

Most of the customers are Chinese, even in the Japanese concession, and the management could have caused an endless amount of confusion for them and for the new management by destroying their meter cards and other records. But a waterworks man, even a Jap, who has been taught for years the sanctity of water works records, apparently cannot forget his "religion" all at once just because some "little war" comes along.

In the middle of the party, cups of tea were brought in by a rather presentable young Japanese woman in ski pants. One of the Chinese remarked aside to me that he hoped it wasn't poisoned. That was four hours ago, so I guess it wasn't. The new Chinese commissioner of utilities called for some brushes and paper, somebody ground up some ink for him on the ink slab, and he wrote out official certificates of appointment for the British engineer and two or three Chinese who were to act for him in taking over the water system. Then there was more bowing on both sides and we left, with the Japs following us all the way out to the car.

Other Systems Taken Over

I have been to three more of these taking-over affairs, though in the other cases it was not from Japs, but from Chinese who have been cooperating, willingly or not, with the Japanese. There is a curious atmosphere, something like that in an American city hall the day the new mayor is inaugurated and the boys in the water bureau don't know whether or not they are on the way out. The little people and all the laborers, unless the place is overstaffed, are likely to stay, but those at the top, and their principal assistants, will probably be replaced.

I must say the Japs had some good-looking maps of their concession, the whole place at a scale of 2500 to 1 and in sections at 500 to 1 scale. At another office we visited today they had 20 surveyors' levels and five transits, mostly of Japanese make. The Chinese engineers said they were good when they were new but more likely to get out of adjustment than American instruments, probably because of poorer metal in screws, etc. They may have cost much less than American instruments. The telescopes were said to be good.

Thanks for sending the copies of your "Here and There" column. Go to it, young feller, on your metric system campaign. The 13-month calendar sounds all right, too, but the metric system seems more important and less likely to arouse opposition.

Perhaps you know that China has got a good start on the metric system, by a curious method. Since the existing units of weight and measure were not standardized, but varied a good deal from place to place, the government fixed them at close to their current average value but in exact ratio to metric units. Thus the standard Chinese pound is now 500 grams but on the merchant's scale it is still divided into 16 ounces as before. The Chinese "li" or mile is 500 meters. Engineers use actual metric units but the measures of the common people are easily converted by simple ratios. But I have even found a couple of Americans trying to reconvert the Chinese to the English system. Atrocity! Sincerely, Arthur Morrill.

2000-year-old Roman Aqueduct Still Functions in Switzerland

The large institution for mental patients at Königsfelden in the canton of Argovie, Switzerland, receives its water through a system of pipes which was established almost 2000 years ago by the Romans. In those early days the main camp of the Roman legions was at Vindonissa, the present Windisch, near Königsfelden and the spa of Baden. The warm springs of the latter were much patronized by the Romans. After the fall of the Roman Empire the water system of Vindonissa became forgotten. However, it was discovered anew in the 14th century when a Franciscan Abbey was founded on this spot.

It is interesting to note that the Roman builders brought the water underground, partly in pipes of lead and partly in wooden pipes encased in concrete, from an elevated water tower some 1½ miles distant. The aqueduct was equipped with special protective devices against enemy destruction. After the canton of Berne acquired dominion of this Argovie district in 1415 the entire water system was once more put in order.

Besides the famed aqueducts of Rome and Pompeii this Swiss system is the only one which is still in practical use today.

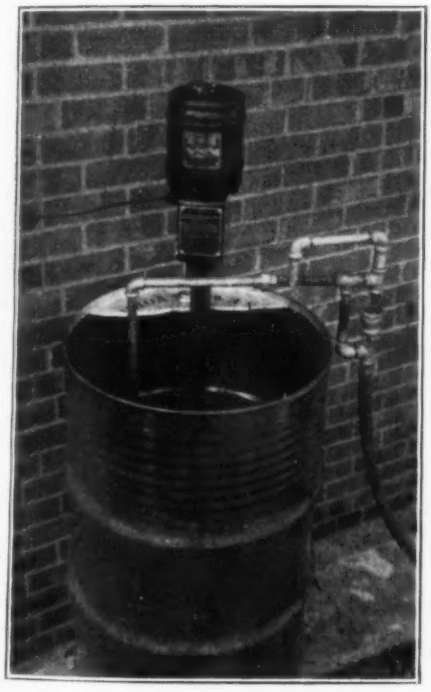
A PRACTICAL CARBON FEEDER

Equally Useful for Dependable Feeding of Lime, Clay, "Mud Alum", or Other Suspensions

By VESTER OPIE
Chief Engineer
DEPT. OF WATER, LIGHT AND ICE
PARIS, MO.

AT Paris, Mo., we wanted to use activated carbon for the removal of tastes and odors from our water which is coagulated and filtered. Faced with the problem of not having a dry chemical feeder we decided to try feeding this chemical in solution form. Of course we soon learned that powdered activated carbon, being insoluble, would require continuous mixing of the water-carbon mixture while feeding it to the raw or settled water. We also found that in feeding through a small orifice trouble occurs from coating up or choking of the orifice by the insoluble carbon or bits of foreign materials.

Inventor Opie



Activated Carbon Feeder

In solving our problem of feeding activated carbon the combination solution tank and orifice feed arrangement (with constant head), which is here illustrated, was built. It has worked with entire satisfaction.

The Feeder

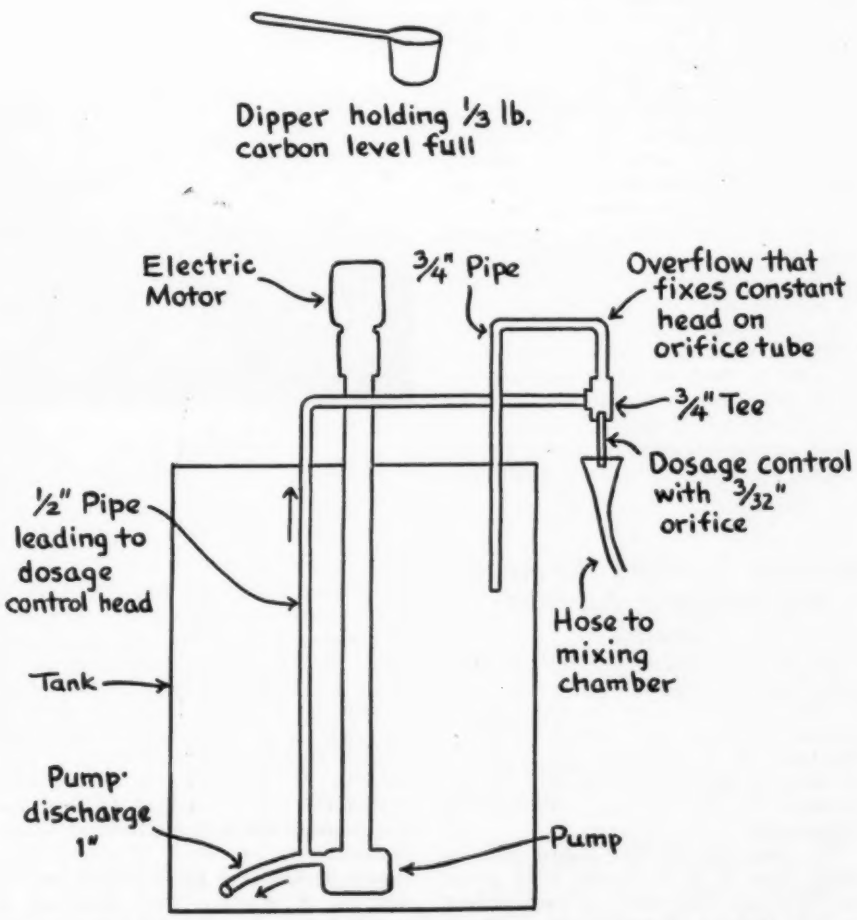
The accompanying photograph and sketch of the combination solution tank and feeder are self explanatory. The tank consists of a steel drum in which is mounted a small Pemberthy Sump Pump. The tank is filled to the desired depth with water, the pump is started and the desired charge of powdered "Nuchar" carbon is added.

Since the sump pump is running, and the arrangement of the main discharge pipe is such as to cause a rapid swirling agitation in the tank, the carbon quickly goes into suspension. The pump runs continuously, or as long as the feeder is in use at least, and a portion of the emulsion passes up through the small riser pipe to the tee containing the glass or metal tube orifice. While a portion passes through the small feed control orifice, and into the funnel and to the rubber hose feed to the point of application, the greater bulk of the carbon-water mixture passes by the orifice and discharges back into the tank through the riser pipe.

By this simple scheme a constant head is held on the feed orifice. At the same time the high velocity with which the liquid passes by the orifice maintains a clean orifice inlet and also prevents stoppage by any bits of bag paper or other foreign matter which may get into the tank.

Dosage Regulation

It is evident that dosage of carbon or any other material being fed can be regulated by one or more of three schemes. First, the emulsion can be



Section Through Feeder, Showing Recirculating—Mixing Pump, Piping and Orifice Arrangement

made heavier (or lighter) in material added in making up the batch in the tank. Second, the orifice can be replaced with one larger or smaller. Third, the head on the orifice can very readily be changed at will by inserting nipples of various lengths in the orifice tee, those extending the height of the vertical return line. Or the same may be accomplished by inserting a plug-cock in the solution return line. By setting the plug at various degrees of opening, the desired head can be secured on the orifice within the range above which there will be no recirculation unless the main discharge pipe at the bottom of the tank be throttled also.

In our case at Paris we use a 3/32-in. orifice tube which meets our requirements. The tube extends up into the tee on purpose, since in this way the flow sweeps past it at high velocity to keep it clear of possible chokage. For measuring the carbon we use a dipper which, level full, holds exactly a third pound of "Nuchar" carbon. For every 10 gallons of water run into the tank (drum) we add one even dipper full of the carbon. We measure the water added through a water meter, which is simpler than taking depth measurements when adding new water to the tank.

This feeder has been in use now for more than three years and we have found it very satisfactory.

CENTRAL SECTION NYSSWA VISITS ELMIRA

W. P. Gyatt
Supt. Sew. Wks.
Syracuse
(Exec. Comm.)

J. M. McCrae
Chi. Pump Co.
Syracuse

Uhl T. Mann
Supt. Ley Creek
Syracuse
(Secretary)

H. R. Fanning
Supt. Sew. Wks.
Bendix Corp.
Elmira

Snapped at the Session

Wm. Douglas
Elec. Chem. Co.
Comillis
(Newcomer)

D. B. Coleman
Supt. Sew. Wks.
Cortland
(Exec. Comm.)

The Central Section of the N. Y. State Sewage Works Assn. held a Fall meeting in Elmira, N. Y., going out of its own "bailiwick" to meet in an adjacent county. The purpose of the trek from the home stamping grounds around Syracuse, was to visit the sewage treatment works of the Eclipse Machine Co., of the Bendix Corp., and to interest sewage treatment operators in that area in forming a local section.

Host at the meeting was Harold Fanning, Superintendent of the Bendix Sewage Plant. Some thirty persons made the trip to Elmira from Syracuse and other cities in that vicinity, and several persons were in attendance from the southern tier counties.

Not only was a trip scheduled through the sewage plant but the visitors were taken through the manufacturing plants where but a short time before the special fuel injection carburetors for B-29's were being turned out, as well as special fuses for shells.

The sewage treatment plant of the Eclipse Machine Co. was originally designed for a contributing population of 3000 but during wartime expanded operations, the actual number of employees ran up to 8000. The plant consists of an elevated Imhoff tank which discharges to four sand beds of 500,000 gpd. capacity. Chlorine is added to the incoming sewage. Provision has been made for the installation of a comminutor and a Parshall measuring flume. The peace-time load is expected to be about 4000 persons. Besides overload of facilities, flash floods and poor distribution on the sand beds contributed to operating difficulties.

Inspection Trip
(Sand Filters in Background)

The section meeting conducted the annual election, with "Bill" Gyatt (3 years) of Syracuse; Dwight B. Coleman (2 years), of Cortland, and Frank Thompson (1 year), of the Dept of Health being elected to the executive committee of the section. Uhl T. Mann, Supt. of the Syracuse Ley Creek Plant and Vice Pres. of NYSSWA was re-elected secretary. Among those attending were H. H. Wagenhals, a past-president of the NYSSWA, Dr. George E. Symons, Pres. of NYSSWA. A committee consisting of Messrs. Dick Gorman, Pat Riley, Harold Fanning, and Ed. Lavalley was appointed to consider the possibility of forming a local section in the Southern Tier Counties. This committee is to submit its report at the next Spring meeting of the parent association.

Indiana Sanitary Engineering Research Advisory Board

The first meeting of the Sanitary Engineering Advisory Board was held November 1, 1945, in the Civil Engineering Building at Purdue University. The purpose of the Board is to advise on research projects which will be undertaken by the Sanitary Engineering Department.

The expenses of the Board will be taken care of by a $1,000 fund given the Sanitary Engineering Department by the Hulman Foundation of Terre Haute. Mr. Anton Hulman, industrialist and public benefactor, is a member of the Board. Other members of the Board are: C. K. Calvert, Engineer in charge of Purification of the Indianapolis Water Company, formerly Superintendent of the Sanitary District of Indianapolis; Prof. R. B. Wiley, head of the School of Civil Engineering and Engineering Mechanics, Purdue University; W. W. Mathews, Superintendent of the Gary Sanitary District and President of the Indiana Sewage Works Association; Dr. W. E. Howland, Professor of Sanitary Engineering at Purdue; L. S. Finch, Chief Engineer of the Indianapolis Water Company, formerly Chief Engineer of the Indiana State Board of Health and consulting engineer; M. H. Schwartz, Superintendent and General Manager of the Vincennes Water Department and director of AWWA; J. L. Quinn, now assistant to the President of Hulman and Company of Terre Haute, formerly State Sanitary Engineer of Indiana, chairman of the Indiana Section of AWWA, and Executive Secretary of the Indiana Society of Professional Engineers; Professor Don E. Bloodgood, Purdue University, and previously Superintendent of the Board of Public Works and Sanitation of Indianapolis; and B. A. Poole, State Sanitary Engineer of Indiana.

SERVICE TO SMALL PLANT OPERATORS

A Few Comments on How Such Can Be Had From Chemical Manufacturers

By CHRIS. F. BINGHAM
Manager of Industrial Sales
VIRGINIA SMELTING CO.
WEST NORFOLK, VA.

WHEN requested to talk on the subject "How chemical manufacturers can render service to small waterworks," I hesitated for a while because I was not quite sure what I was supposed to talk about. However, after thinking it over, it became apparent that some of the services that look so obvious to me today, as a salesman, did not look that way when I was actually operating a water purification plant. I should say that I did not realize their availability — in fact, I did not particularly look for them because I did not know they existed. I think that is the condition which exists with a lot of operators today. They really do not know to what extent manufacturer's services are available.

In practically every trade journal you will find advertisements offering services to you from manufacturers, if you will only ask for them. There is an old saying that it does not cost anything to ask. Indeed, that is true; in fact, you might be paid for asking, indirectly of course, by more efficient use of your present raw material or by the adoption of a new raw material, but it certainly is worth while, I assure you.

Since we have placed the burden for originating this request for service on you, as operators, it might be well to understand a little more fully how the manufacturer usually works as far as you are concerned. These conditions may not be true for every manufacturer, but I believe they will hold in general.

About the Salesman

First,—the salesman, commonly referred to as a "Peddler" or "Ambassador of Commerce," and, lately, as the "Order Taker," is the first line of contact with you or any customer. Let us consider him for a little while.

Usually the salesman is a fellow who tries to understand people, their differences, who has patience and ambition, and, strange as you may think it, is not afraid to work. In his relations with you as a customer or prospective customer he must know more about his product than you do, but, at the same time, he must be modest about it. He must be able to command your respect and develop a mutual benefit from the product he is trying to (or does) sell you. He is usually genuinely enthusiastic over what he offers, but not given to exaggerative statements about its capabilities. Practically all chemical salesmen in the field today are either technically trained or have considerable practical experience, or both, in the field which they are covering. Last, but not least, he is sincere in his work. If you will try to understand these qualities in the salesman who calls on you, then you will know him and he will know you, and half of your job is done.

The Author

This paper was presented before The Virginia Section of the American Water Works Association almost two years ago by Chris Bingham, who at the time had become Eastern District Manager for the Columbia Chemical Div. of Pittsburgh Plate Glass Co. Prior to that the author was for several years Treasurer and one of that "wheel-horse" team of Smith and Bingham in the Virginia Section, while he was Sup't of the Richmond, Va. Filter Plant.

Because of his training and background as an operator, before becoming a manufacturer's representative, Mr. Bingham was in an excellent position to discuss the topic of how a small plant operator can benefit through assistance and suggestions made by field representatives and Technical Service Departments of commercial firms.

We regret that this helpful paper has been lost sight of for such a long time. It turned up in Ye Ed's files recently, and we are printing it because Chris Bingham's suggestions to operators and managers of small water works apply equally to operators of small sewage works — perhaps even more so.—L. H. E.

And the Service He Can Render

Now—What service can this salesman render you? First, and, perhaps, the most important service is that this man can bring you ideas and information on what others are doing in your particular field. He talks to many operators, sees many operations and field and plant practices, attends as many meetings as possible. If his eyes and ears are open, and they usually are, he will pick up more information in a few months than the average operator can obtain on one job in several years. The genuinely interested and *helpful* salesman will learn of good things and pass them along. Why do most of you attend meetings? Certainly not to listen particularly to a paper such as this, because, after all, this will probably be printed in the proceedings of your meeting, and you can read it when and if you want to. The cost of doing that is nothing but your time. To come to this meeting today has cost you money, and I venture to say it was done for one major purpose—to talk over and discuss with other operators, engineers and chemists your problems. Maybe you do not recognize it as such at the particular moment, but if you find out how John Doe is doing an operation at his plant it will be put in a little pigeonhole in your subconscious mind and some day when you need it, it will be there. Chemical salesmen, in general, can't afford to be in too much of a hurry, and I'm sure if you give any one of them a chance he'll sit and talk shop with you most of the day. He'll learn something, too, and he's anxious to do it, but he won't do it unless he feels he knows you. You can get a convention brought to you at no cost then if you want to, just by trying to know the salesman who calls on you. Thus he may save the operator's company or city a good many dollars; and, inwardly, he nourishes a hope of being instrumental in bringing credit to the operator.

The Technical Service Department

Back of every chemical salesman in the field there is usually a technical group in the manufacturing plant who are working on the practical application to your particular

industry of the products they manufacture. To most of you these men are known as the Technical Service Engineers or members of the Technical Service Department. They are usually trained specialists who devote their time, not to the sale of chemicals, but to fitting their product to your particular needs; or, to finding out why their product does not fit your needs. This service is, in most cases, absolutely free, but if you were to hire a consulting chemist or engineer to do this same work, I am sure you would appreciate the value of the Technical Service organizations. Another service rendered by this group is in the investigation of complaints on products. Many fine improvements are made as a result of customers' complaints. The Technical Service Engineer serves more or less as the customer's representative to the manufacturer's plant. These same Technical Service men usually have available, either in their own Department or in conjunction with the Research Department of the manufacturer, adequate laboratory or semi-plant scale pilot plants for investigation of their chemicals as related to coagulation, disinfection, corrosion control or whatever your problem may be. Naturally these facilities are used to improve one's product and to make it in some way superior to a competitor's, but such competition is always good for the consumer.

Another service available to you as operators is the advice and experience of the cooperative effort of a group of manufacturers of any one or group of products. The one with which most of you are familiar, because of the splendid work of Messrs. Enslow and Faber, is The Chlorine Institute, 50 E. 41st Street, New York, N. Y. This Institute is financed by chlorine and chlorination equipment manufacturers in order to obtain for you unbiased and impartial information on the proper use and handling of chlorine, particularly in the sanitary field. The answer to such problems as safety, proper use, and engineering detail for construction of chlorine handling equipment is readily available from the Institute merely by your writing them, or getting in touch with their staff. The one outstanding example of their work was the development of a standard valve for all chlorine manufacturers so that you would not have a different setup on connections every time you obtained a cylinder of chlorine from a different manufacturer.

Practically all chemical companies have available considerable information in the form of booklets on properties of the chemicals, technical data on their proper use, technical data on construction of handling equipment, and one has even gone so far as to publish a booklet on water analysis. These are available on request. The pioneer example of this work was no doubt the book published by the American Steel and Wire Company on the use of iron sulphate in water purification. One on the use of lime has been published by the National Lime Association, 927 15th Street, N. W., Washington, D. C. This was written by a practical operator, C. P. Hoover of Columbus. All this library of information is usually free just by writing the manufacturer or association.

Another manufacturer's organization, although not primarily connected with Water Works, but available to your Street or Highway Department, with which many of you are closely associated, is the Calcium Chloride Association, 4145 Penobscot Building, Detroit, Michigan.

In conclusion then—

First—You have the service of the salesman if you will take time to know and understand him.

Second—The service, on request, of engineers and chemists from the Technical Service Department of the manufacturer's organization.

Third — The trade association, such as The Chlorine Institute and The National Lime Association.

Fourth—The printed information of the manufacturers on their products.

All of this is usually free but you will have to ask for it. And manufacturers are usually delighted to be asked.

Fifty Years After

Mueller Co. Takes Part in Anniversary of First Auto Race.

The name of Mueller has not always been attached solely to brass valves, hydrants, gate valves, copper and brass pipe. No! Fifty years ago the name of Mueller was identified with an automobile. More particularly with a special automobile that took part in America's first automobile race which was staged in Chicago on Thanksgiving Day a half century ago.

On Thanksgiving Day of this year, six early model automobiles went chugging down the boulevards in Chicago in a reenactment of the first automobile race ever run in America. The original event was held on Nov. 28, 1895, and the cars traveled a course of 52 miles, from Jackson Park to Evanston and return. The anniversary event was held under the auspices of the Museum of Science and Industry, and the cars followed the original course.

None of the original cars are in existence today and of the original contestants only the Mueller Co. of Decatur, Ill., and the R. H. Macy Co. of New York City are still in business. One of the special guests at this year's anniversary event, was Mr. Charles B. King, of Larchmont, N. Y. Serving as umpire, Mr. King rode in the original entry of the Mueller Co. in the 1895 race.

On the day of the original race, the streets were covered with several inches of snow and sleet. Driving was so difficult that Oscar Mueller, driver of the Mueller entry wrapped the tires with rope to give them traction. After an all day grind in the bitter cold, and unprotected from the elements, Mr. Mueller lapsed into unconsciousness and Mr. King, the umpire, drove the Mueller entry the rest of the way to capture second place money of $1500. J. F. Duryea, one of the most famous of the drivers, won first prize of $2000 with an average speed of five miles per hour, made by his Duryea Motor Wagon.

One gasoline car could not generate enough power to push through the snow. Another crashed into the rear of a horse-car and was badly damaged. One electrically driven entry quit when the batteries failed. Both the drivers of the cars and the watchers of the event probably had little concept of the future of the motor car, and few persons watching probably thought that 50 years after, the name of Mueller would be identified with important water works equipment.

Ill. Sew. Wks. Operators' Conference

With more than 100 operators attending, the Illinois Sewage Treatment Works Operators held their annual meeting at Springfield, Ill., on Nov. 8-9.

Officers elected for the coming year were L. H. Freeman, Geneva, as Chairman; Clifford H. Fore, Carbondale, Vice Chairman, and Walter M. Kunsch, Champaign, Secretary.

Speakers at the sessions included C. W. Klassen, Tech. Secy. State Sanitary Water Board; Harry E. Schlenz, Vice-President, Pacific Flush Tank Co.; Walter A. Sperry, Supt. Aurora Sewage Works; R. C. Merz, Engineer, Chain Belt Co.; L. S. Kraus, Chemist, Peoria Sanitary District; Douglas E. Drier, State Health Dept.; J. G. Weart, State Health Dept.; C. C. Larson, Chief Chem., Springfield Sanitary District; and Dr. W. D. Hatfield, Supt., Decatur Sanitary District.

A round table discussion was led by C. E. Corrington, Clinton Sanitary District, and F. E. Johnson, Elgin San. Dist. The organization is sponsored by the Ill. State Dept. of Health and the State Sanitary Water Board.

NORTH DAKOTA CONFERENCE MEETS IN FARGO

A Report by

KENNETH PIPER*

THE North Dakota Water and Sewage Works Conference 17th Annual Convention was held in Fargo on November 8 and 9, with a well attended Pre-Convention Smoker taking up the evening of November 7.

Presidents

(Retiring) *F. W. Pinney*

(Incoming) *S. K. Svenkeson*

Approximately 121 delegates attending, constituted the largest registration in the history of the Conference. The meeting was organized on very short notice after government lifting of travel restrictions. This fact and the still present difficult traveling conditions unquestionably cut the enrollment down. In the face of these adverse circumstances the unusually high enrollment was particularly gratifying to the Conference officials. The strength of the Conference seemed to be soundly established and its future looks particularly bright.

Nearly thirty North Dakota municipalities were represented at the Conference which was roughly 1/3 of the municipalities in the state having public water supply systems.

*Sanitary Engr., State Dept. of Health, Bismarck, N. D.

Mayor Sorenson Travels Farthest

No prize was offered this year to the person traveling the farthest distance from within the state to the Conference, but had a prize been offered it would have been won by Mayor J. S. Sorenson of Grenora. Mayor Sorenson, an ardent Conference booster, traveled the full length of North Dakota from west to east plus a sizeable part of the north and south distance to be present at the Fargo Convention.

As might be expected, Fargo, the host city, headed by F. W. Pinney, Supt. of Sewage and President of the Conference, was represented with the largest number of delegates. The neighboring metropolitan city of Minneapolis received second honors, with Bismarck and Grand Forks grabbing off third and fourth places in almost a dead heat. The Fargo City Commission, headed by their President, Fred O. Olsen, attended in a body and hospitality in true Dakota style was the order of the evening. In case you were there, and want to know, the talented young musician playing the accordion solos was Audrey Remme.

Orlady Asks "What Will You Do When You Run Out of Water?"

The high light of the Convention was unquestionably the address by L. T. Orlady, business man from Jamestown and member of the North Dakota Water Conservation Commission.

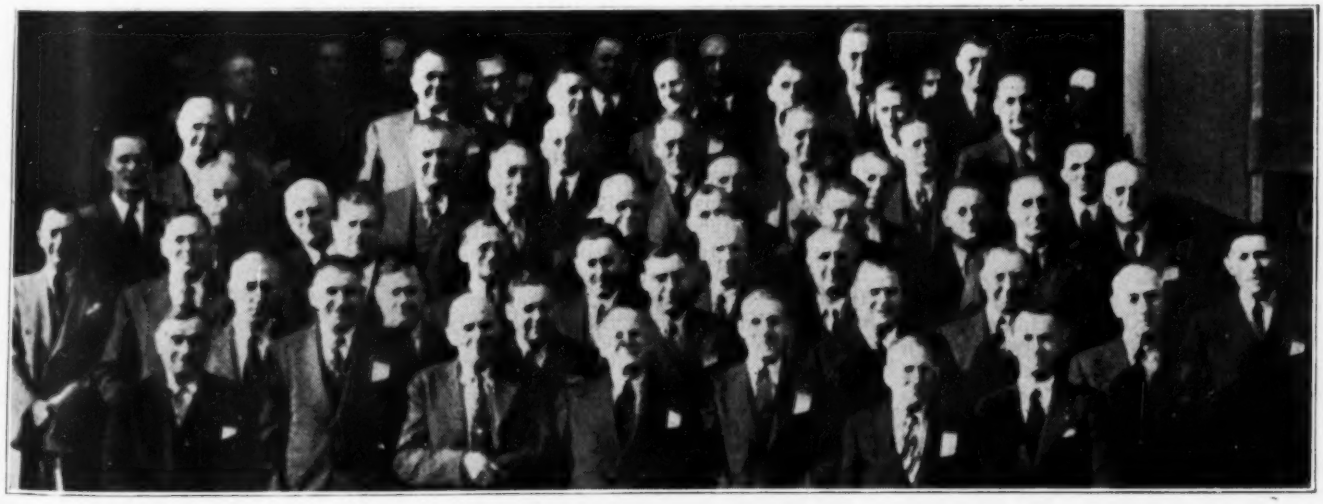
One of the very first statements in Mr. Orlady's address was "Just what are you men going to do when you run out of water in North Dakota? Just what are you going to do?"

Question Poser
L. T. Orlady

New Director
M. O. Thomas

Mr. Orlady went back in the history of North Dakota and reviewed some of the difficulties experienced during the drought period. He stated that in 1934 there were 189 days during which there wasn't a drop of water that ran under the bridge across the Red River at Fargo. For his authority he quoted Park Tarbell, City Engineer of Fargo.

Mr. Orlady traced the laws setting up the North Dakota Water Conservation Commission and outlined some of its duties and authorities and stated that, "the Bureau of Reclamation, under the leadership of Mr. Bill Sloan, conceived the idea of harnessing the water of the Missouri and bringing it into an area that definitely needed it for irrigation purposes. That is, the reclaiming of land, land that didn't get enough rainfall and also for the purpose of replenishing the streams in the center of the State in order to



Most of the 121 Attending

store up water and insure an adequate domestic supply."

Continuing, Mr. Orlady said, "You men in the eastern part of the State

Old Friends

Maj. Glen Hopkins USPHS Kansas City, Mo. — *W. N. Lauer Dorr Co. Chicago, Ill.*

have lots of worries on your mind in the future. Only a month and a half ago I was up at Park River, partly to negotiate for that reservoir on the south park branch of the Park River, and it was negotiated and when I stayed at the Park Hotel there, salt water was running through the mains of that hotel. I talked to the mayor about it and he said, 'Unless we get a lot of rainfall we will have salt water most of the winter.'"

Delegates heard that water and sewage facilities in England are far below American standards. This information was presented in a paper prepared by George Toman of Mandan, former Sanitary Engineer with the State Department of Health. Mr. Toman spent many months in England and some time in France. As he was unable to be present, his paper was read.

Outside Clarification Tank Operates Satisfactorily in Cold Climate

A paper on clarifiers by John Kleven, Sewage Works Superintendent of Grand Forks, introduced some pertinent thoughts. Mr. Kleven stated that clarification tanks may be made of wood, iron, steel, concrete, or they may be as simple as a plain hole in the ground. In any case, the material from which they are made is determined by, among many things, the material available, the cost and durability of the building material, and the anticipated life expectancy of the function the clarification tank is expected to serve.

Mr. Kleven continued, "Two clarifiers are installed at our plant at Grand Forks, they are round, thirty-five feet in diameter, eight feet deep at the side walls, have bottoms sloping towards the center at a grade which makes the clarifiers about nine feet at that point, and they are made of concrete.

"We tried the intermittent operating schedule for a time. When we discovered that the sludge was beginning to come to the surface in lumps, we changed to continuous operation and have had no trouble since from large gas bubbles.

"One of the clarifiers at Grand Forks is located outside and exposed to all kinds of weather and the other is covered with a well built and weather tight building heated in the wintertime. Temperatures as low as 38° below zero F. have not appeared to hamper in the least the full and regular operation of the scheduled mechanism in the outside clarifier. The trouble with paint on iron work, etc. outside is less than that on a similar structure on the clarifier inside the building."

Brownell Discusses Numerical Rating for Water Systems

O. E. Brownell of the Minnesota Department of Health discussed the numerical rating for water systems. The numerical arrangement as outlined by Mr. Brownell provided for an over-all score of 100 for perfection. The water system was broken down into its various components including "Source" with a possible perfect score of 40. "Prime Moving Equipment" with a

Three S's

(A Sec'y, A Super., A Sec'y)

Bernard Thompson, Secy., State Plumbing Board

Kenneth Johnson, Sewage Plant Supt., Dickinson, N. Dak.

J. H. Svore, Secy.-Treas., N. Dak. Water and Sewage Wks. Conf. and Div. of San. Engr.

possible perfect score of 30. "Distribution System" with a possible perfect score of 20 and "Operation and Operators" with a possible perfect score of 10. Inasmuch as a defect in the source of the system would carry through the other divisions and increase the possibility of ultimate contamination of the water supply, the system provided that any penalty deducted from one of the first divisions such as "Source" was likewise deducted from each of the following divisions. Mr. Brownell stated that this system had proved of benefit in providing for a meeting of minds insofar as the State Department of Health, the various City Commissions and the Water Works Superintendents were concerned.

Sanitation Facilities Survey Defined as an Inventory of Sanitation Needs

Major Glen Hopkins taking the place of Major C. H. Atkins, Sanitary Engineer of the U. S. Public Health Service in Kansas City, Missouri, discussed the U. S. Public Health Service sanitation facilities survey. Major Hopkins stated that he believed the survey could better be called an inventory of sanitation needs. The term "survey", he stated, denoted a detailed study and recommendations that are more probably the role of a consulting engineer and an authority on detailed study.

The purposes of the USPHS survey are as follows: "(1) To provide Congress and the Public Health Service with reasonably accurate information on the specific needs for sanitation facilities of each community in rural areas throughout the nation, based on actual field surveys.

"(2) The whole survey is designed to lend support for an over-all sanitation program for states and municipalities in order to bring facilities up to accepted standards to make our cities, towns and farm communities healthful places in which to live.

"(3) In the event that a Federal Works program is necessary to stabilize the national economy, this inventory will provide a backlog of necessary sanitation projects that will take their rightful place in a community public works program.

"(4) Previous public works programs have had a tendency to benefit larger communities in possession of funds for the maintenance of engineering personnel, who readily produced completed plans in the towns where such a program was undertaken."

Laird Explains Activities of Geological Survey

Wilson M. Laird of Grand Forks, State Geologist, explained what is being done in underground water studies, explaining that there is urgent need for these studies in many parts of North Dakota. He said that the State Water Conservation Department had purchased a well drilling machine to do some of this survey work.

"This machine was purchased solely for the purpose of providing a measuring yard stick to determine cost of drilling," he said. "We expect to employ commercial well drillers for most of this work."

???

O. E. Brownell of the Minn. Dept. of Health poses a brain-twisting question to E. L. Lium, right, of Lium & Burdick, Cons. Engrs., Grand Forks.

He said it is hoped to get work under way soon on the big underground water survey project through the Red River Valley adjacent to Fargo and Moorhead, a project into which the states of North Dakota and Minnesota, the Counties of Cass and Clay, and the cities of Fargo and Moorhead are participating, in cooperation with the U. S. Geological Survey.

W. P. Tarbell
City Engr.
Fargo

Everett Lobb
San. Engr.
Fargo

Phenolic Limits in Sludge Digestion Discussed

Professor A. M. Cooley, University of North Dakota, presented a paper on "Phenol Limits in Sludge Digestion." This research work was done as a result of difficulties encountered at the Grand Forks municipal sewage disposal plant resulting in phenols being discharged into the sewer from a pilot plant producing hydrogen from lignite coal. Laboratory findings indicated that anaerobic decomposition would still take place in a digester under concentrations of 50, 100, 150, and 200 parts per million of phenol. As the amount of phenol was increased from 50 ppm. on up to 200 ppm. the rate of reaction was merely retarded.

Fluorides Are Troublesome

Mr. Quinton B. Graves, Acting Director, Division of Sanitation, South Dakota State Board of Health, presented an interesting discussion on "Fluoride Removal". His paper dealt mainly with recent methods used in fluoride removal and their cost. In addition, he included considerable discussion on the effects of fluorides in drinking water in their relation to mottled enamel and the prevention of dental caries in teeth.

Mmmm! Not Bad!

Ted Lofgren, Cutler-Magner Co., Grand Forks, accompanied by Audrey Remme.

Fred Hagen, Sew. Wks. Commissioner
Fred G. Hill, Crane Co.
Ora Ayliffe, Water Wks. Supt.
(All from Fargo)

City Plans a Water and Sewerage System

L. W. Burdick, Consulting Engineer of Lium and Burdick, Grand Forks, presented a paper on planning a water and sewage system. He outlined the steps a city should go through in planning for the construction of a water and sewage system. Mr. Burdick stated that the most important consideration is the matter of financing the project and, second, the routine steps necessary to construct the project in accordance with the laws of the State. He outlined the relationship between the city and the consulting engineer and the various methods of financing which are available to a municipality.

Minot Sinks Caisson by Unique Method

S. K. Svenkeson, Public Works Superintendent of Minot, presented a paper on the construction of a Minot sewage lift station. The construction of this station involved the sinking of a caisson by a new and unique method.

It was necessary to sink the sewage lift station approximately 30 feet into water-bearing material of the most unstable sort.

A reinforced concrete caisson was constructed with a circular steel cutting blade four feet high and twelve feet in diameter, fastened permanently in place at the bottom. A solid reinforced concrete bottom was cast in this caisson. In this bottom were placed a series of jetting holes with an orifice in the center for inserting a suction line for the removal of the loosened material. Utilizing this method the caisson was sunk with no untoward instance. The rate of sinking was variable, the least in any one day being three inches, the most four feet.

Because of the difficulty experienced in getting bidders, the job was done by force account and exclusive of the cost of the pump the total job came to $5,746.00.

Fred C. Hagen Master of Ceremonies at Banquet

The Annual Banquet was held at the Town Hall of the Gardner Hotel with Fred C. Hagen, Fargo Water Commissioner, acting as Master of Ceremonies. Ken Kennedy from station WDAY was in charge of entertainment and was assisted by other radio station personnel. The session was thoroughly hilarious and cash prizes were distributed during the playing of a guessing game.

L. W. Burdick
Cons. Engr
Grand Forks

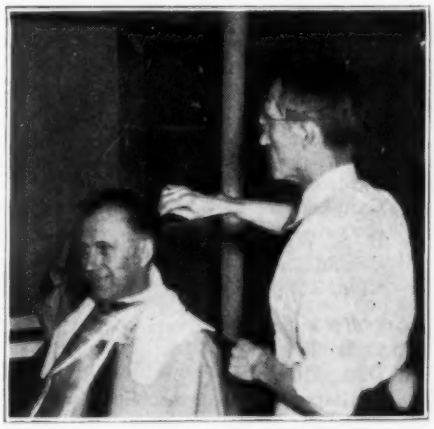
John B. Kleven
Sew. Wks. Supt.
Grand Forks

New Officers Elected

The session closed with the election of S. K. Svenkeson of Minot as President of the Conference. Other officers elected were John B. Kleven, Grand Forks, Vice President; J. H. Svore, State Department of Health, Bismarck, Secretary-Treasurer; and the following new members of the Board of Directors, Colonel George Toman, Mandan, and M. O. Thomas of C. B. Lyon and Co., Minneapolis.

Filby Urges Water Works Men to Sell Their Job to Their Communities

An unusual feature of the closing minutes of the session was an informal address by E. L. Filby, Engineer for Black & Veatch, Kansas City Consulting Engineers, who urged those in charge of water works plants throughout the State to be more aware of the importance of their positions and to do a better job of selling themselves and their job to their home communities.



Shave? Mr. Graves

Q. B. Graves, San. Engr., S. Dak. State Bd. of Health, being prepared for his platform appearance

NEW JERSEY SECTION AWWA ANNUAL MEETING

Three-Day Session in Atlantic City Draws Record Attendance

Chairmen

(Incoming) *Wm. E. Collings, Supt. of Water, Collingswood*

(Retiring) *Geo. D. Norcom, Cons. Engr. Chem., Red Bank*

IN the words of one registrant, the the New Jersey Section of AWWA came of age at its 6th annual meeting held in Atlantic City, Nov. 8-9-10. The registration of 240 plus was a record; more wives attended than ever before; a dinner attendance of 204 topped all previous meetings; and an attendance of nearly seventy-five at the Superintendents' breakfast and round table discussion was completely unexpected. To match these records were a series of exceptionally interesting papers, symposia and discussions which apparently were as instrumental in drawing the crowd as were Atlantic City's famous Boardwalk, and Hackney's Fish Dinners.

New Officers Elected

As a result of the annual election, the following officers were elected for the year:

Chairman
William E. Collings
Supt. of Water and Sewers
Collingswood, N. J.

Vice Chairman
Roswell P. Roper
Engr. and Gen. Manager Water Dept.
East Orange, N. J.

Trustees
E. D. Sheehan
Supt. of Water
Camden, N. J.

P. S. Wilson
Consultant
Glen Ridge, N. J.

Secretary-Treasurer
C. B. Tygert
Dist. Manager
Wallace and Tiernan Co.
Newark, N. J.

Mr. J. Arthur Carr, Supt. of the Water Dept. of Ridgewood, N. J., is the AWWA director from the New Jersey Section.

Fuller Award

At the annual banquet, the Fuller Award Committee announced the selection of John L. Radcliffe, Jr., Chemist, Elizabethtown Water Co., Elizabeth, N. J., to receive the Fuller Award for 1946, "For his diligent pursuance of one major subject, Water Purification; for his sound reasoning in water treatment problems; for his ability to apply his ideas in practice; and for his willingness to share his knowledge with others." The presentation of the citation was made by A. E. Griggin, Chairman of the committee.

Besides the presentation of the Fuller Award selection, the guests at the banquet heard Wendell LaDue, Vice-Pres. of AWWA and Gen. Mgr. of Water and Sewage Treatment in Akron, Ohio, give a philosophical talk on things of interest to the water works man.

New Officers

Roswell S. Roper, Supt. Water, East Orange (Vice Chairman)

P. S. Wilson, Consultant, Glen Ridge (Trustee)

Mr. LaDue commented favorably on the results of *Blueprint Now* and asked for the continuation of effort along the line of planning and carrying out those plans. "Good public relations or consumer relations are of utmost importance to the water works profession as a whole," said Mr. LaDue, and while the water works superintendent is doing his best toward the establishment of those good relations, he, the superintendent, wants a little recognition for his own well-done job. The superintendent should remember that his men, too, want a little recognition. It is a small thing that will bring big returns.

As to proper recognition of the water works profession generally, Mr. LaDue said it was up to the man to blow his own horn, but that the new AWWA Public Relations Committee might provide the tune. In his final words, the AWWA Vice President quoted from Thoreau, saying: "The Dawn does not break for him who is not awake"—A bit of pertinent advice for water works operators.

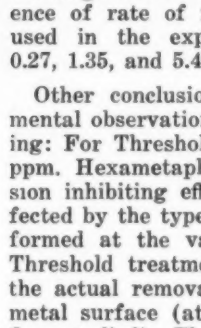
Corrosion Control

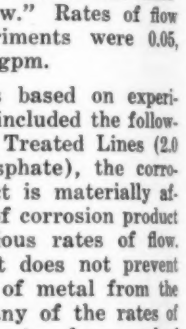
In a "Study of Corrosion Control with Sodium Hexametaphosphate," Peter E. Pallo, Asst. San. Engr., Hackensack Water Co., gave the results of a detailed study of the effects of flow rates on corrosion control when hexametaphosphate is used. Comparisons were made with untreated water as well. The whole paper, which covered a study of nearly two years, presented the results of research carried out as a part of a graduate thesis submitted to the Graduate Division of the College of Engineering, New York University.

Using black iron pipe, and a physical set-up that allowed for observation of iron pick-up, oxygen depletion, tuberculation, loss of head, loss of weight, and general corrosion effects, the technic employed was such as to produce very useful information.

One very definite conclusion was reached; namely, that, "to be of any practical value, any corrosion control investigation must include the influence of rate of flow." Rates of flow used in the experiments were 0.05, 0.27, 1.35, and 5.40 gpm.

Other conclusions based on experimental observation included the following: For Threshold Treated Lines (2.0 ppm. Hexametaphosphate), the corrosion inhibiting effect is materially affected by the type of corrosion product formed at the various rates of flow. Threshold treatment does not prevent the actual removal of metal from the metal surface (at any of the rates of flow studied). The rate of removal of metal from the metal surface increased with increasing rates of flow to some critical rate of flow after which the corrosion rate decreased. The rate of tuberculation increased with increasing rates of flow to some critical flow rate (between 1.35 and 5.40 gpm.) after which the formation of friction-causing components was materially reduced.





More Officers

C. B. Tygert, Wallace & Tiernan, Newark (Secy.-Treas.)

J. A. Carr, Supt. Water, Ridgewood (AWWA Director)

In comparing untreated to threshold treated water, it was found that under conditions of low rates of flow and up to some critical velocity the rate of corrosion (removal of metal from metal surface) was higher in the threshold

Discussion Leaders

E. Vernon Smith
Supt. Water
Park Ridge
(Supts.' Rd. Table)

Martin Fleutje
Chem., Am. W'tr
Wks. & Elec. Co.
Glen Ridge
(Question Box)

treated water than in the untreated water. Threshold treatment showed a marked inhibiting effect in the rate of tuberculation over those lines receiving no treatment. Under the conditions of low flow rates, the products of corrosion formed in conjunction with threshold treatment appeared to be more loosely adherent to the pipe wall than those products formed in pipe passing water without treatment.

The discussion of the paper prepared by Owen Rice was presented by Jack Adams of the Calgon Co. Mr. Adams explained that different results were obtained in different waters.

Graphitic Corrosion

Graphitic corrosion is a peculiar form of disintegration found only in cast iron and is due to the very nature of that carbon-iron alloy, according to L. M. Leedom, Sect. Const. Engr., Div. of Water, Newark, N. J. Mr. Leedom's paper was titled "Graphitic Corrosion of Cast Iron as Experienced in Newark" and was devoted to a presentation of the reasons for graphitic corrosion and the observations made mostly on valves in the Newark area.

The graphitic corrosion was noted on the inside of valves, not on the outside where contact with the earth might have been a factor in electrolysis. Not only were the discs of the valves graphitized but the top castings were graphitized as well in many instances. Most of the valves affected were made nearly fifty years ago. Modern dense alloys with higher tensile strengths should be less liable to graphitic corrosion.

Research indicates that graphitic corrosion will continue indefinitely on the old iron casting and nothing can be done to stop it, but Mr. Leedom suggests a modification of the ASTM specification A 126-42, particularly reducing the limit for phosphorus and sulphur as well as establishing other limitations. The specification adopted by the Newark Division of Water is as follows:

Constituent	Content	
Total Carbon	3.00%	+ 0.15%
Silicon	2.00	+ 0.25
Manganese	0.75	+ 0.15
Nickel	1.05	+0.15
Chromium & Molybdenum	0.35	+ 0.05
Phosphorus (Maximum)	0.30	
Sulphur (Maximum)	0.12	
Tensile strength, min.	40,000 psi.	

Geology of Water Supply Wells

Meredith E. Johnson, New Jersey State Geologist, speaking on the "Relation of Geology to Water Supply Wells in New Jersey," showed by means of maps, diagrams, and drawings how various geologic formations affect the quantity of a well supply. It was apparent from his descriptions of faults, rock layers, and sedimentary deposits why some wells were "dusters" while others in the same strata were producers. Without going into the detail of the various rock formations and their locations, it was obvious from Mr. Johnson's paper that a geologist is a handy person to have around when one starts to drill a well for a water supply in New Jersey.

Taste and Odor Control

Under the direction of A. E. Griffin of the Technical Service Dept. of Wallace and Tiernan, the "Symposium of Taste and Odor Removal Methods" introduced three speakers with three different attacks on the problem.

Jos. Reid, Chief Chemist, Trenton Water Dept., discussed the application of break-point chlorination control to the taste and odor control problem in his supply. Using the Delaware River water which contains an average of 35 ppb. of phenol, it has been found that to carry a residual of at least 1 ppm. of free chlorine in the filtered water not only eliminates the taste and odor problem but also reduces the number of gas formers in the treated water. Consumption of ammonia and activated carbon is reduced with this treatment.

John L. Radcliffe, Chemist, Elizabethtown Water Co., Elizabeth, N. J., presented the case for the use of activated

More Program

R. E. Bonyun
Supt.
Passaic Valley
Water Comm.
Paterson
(Licensing)

Joseph Y. Reid
Chief Chem.
Water Dept.
Trenton
(Tastes & Odors)

carbon, pointing out that activated carbon is a physical agent added to the water for the purpose of actually removing by adsorption the taste, or rather, odor-producing compound. Activated carbon cannot be added in too great an amount and will not cause an undesirable chemical change in the odor-producing compound. In short, activated carbon may be considered a positive treatment because of its method of removing the offending substance.

Program

John H. Murdoch
Attorney
Am. W'tr Wks. &
Elect. Co.
(Cross Connects.)

H. T. Critchlow
Chief Engr.
Div. Water Policy
Trenton
(N. J. Ship Canal)

L. Newell, Supt. Water Works, Morrisville, Pa., which also uses the Delaware River as a source of supply, explained the use of chlorine dioxide treatment at that plant for taste and odor removal. Originally, odors were algal in origin but most odors today are industrial in nature. In the Morrisville plant, chlorine, alum and soda ash are added to the raw water. Chlorine dioxide is added to the filtered water, which contains an 0.5 ppm. residual chlorine content. The distribution system contains an 0.2 ppm. residual content after the chlorine dioxide has been added. Mr. Newell stated that the treatment had been completely effective in his water supply.

The New Jersey Ship Canal

The construction of a ship canal across the "waist" of the state of New Jersey is a proposal of the War Department of the U. S. Government. Principal purpose of the canal is to make available an inland waterway that will prevent the loss of shipping in war time off the Atlantic Coast, such as was experienced in the past few years.

In discussing this proposed canal, **H. T. Critchlow,** Chief Engr. of the New Jersey Division of Water Policy and Supply, talked only of the effects of such a canal on the water supplies of the state. Other controversial aspects of the problem were not considered. The canal proper would be 86 miles long, and 27 ft. deep, with the maximum cut 160 ft. and the width of the maximum cut 1200 ft. at the top; 16 miles would run through farm land, and the total acres removed from use would be 4000 for the actual cut and 6800 for the disposal area. The earth removed would be 90 percent of that removed in the Panama Canal. The canal will cross 27 highways, several railroads, and a number of streams. Although elaborate preparations are planned to keep the salt water out of the canal, the construction of such a canal will radically lower the water

table in that section of the state and drastically affect a number of public water supplies.

As a result of this lucid presentation of the problems involved in this proposed undertaking, the meeting passed a resolution asking that the Trustees of the section study the matter and recommend appropriate action to be taken at the next meeting.

A Policy for Cross Connections

John H. Murdoch, Jr., Attorney for the Amer. Water Works and Electric Co., gave the meeting the policy for cross connections which the company has adopted within the past year.

Inasmuch as Mr. Murdoch has published a paper outlining this policy in *Water Works and Sewerage* in the August, 1945, issue, page 237, and as that same issue carried an editorial on that paper, it is not necessary at this time to review the material presented at the meeting by Mr. Murdoch.

Question Box

Under the able guidance of Martin Flentje as Quizmaster and Quipmaster, a contest was held between four representatives of the North Jersey Water Superintendents and four representatives of the South Jersey Water Superintendents. In the words of the program, they were "all $64 questions,—some with answers." By a very narrow margin it was decided that the North Jersey boys had won.

After this lively session, the meeting was thrown open to the discussion of several other topics of interest including the matter of the adoption of the metric system of measurement and its effect on the water works profession.

Superintendent's Breakfast and Round Table

With E. D. Sheehan, Supt. of Water, Camden, and Trustee of the Section, presiding, a well-attended breakfast was followed by lively discussion of a number of topics. **E. Vernon Smith** acted as Discussion Leader for the Supts.' Round Table.

Programmers

Peter Pallo
Asst. San. Engr.
Hackensack Water Co.
(Hexametophosphate)

M. E. Johnson
State Geologist
Trenton
(Wells)

Valve Inspection

Valve Inspection, the first topic of the morning, was introduced by **J. Arthur Carr,** Supt. of Water, Ridgewood, who stated that once yearly operation of valves over the entire system pays dividends. Cleaning of the system was lowered by 3.4 cents per foot when it was discovered that all of the valves would work. Only inspection and operation can insure that all valves not only do work, but are open.

Quiz Program
North Jersey vs. South Jersey
(Martin Flentje, Quipmaster)

Roswell S. Roper, Gen. Manager, E. Orange Water Dept., said that valve inspection lowered the cost of pavement cuts as well, because it reduced the number required for valve repairs. Mr. Roper also stated that the use of valve-operating machines saved time, manpower and money.

L. M. Leedom, Sect. Const. Engr., Division of Water, Newark, emphasized the value of valve-operating machines, and the yearly operation of valves, and both he and Mr. Carr advised the use of penetrating oil and suggested means for reaching the stem of the valve with the oil.

Samuel Newkirk, Chief Engr. of the Board of Water Supply, Elizabeth, and past president of AWWA, emphasized the importance of keeping records on valve operation, both openings and closures. It saves time, and assures better operation of the system, particularly in the case of fire.

Labor Relations

The second topic for discussion was Labor Relations, with **Wendell LaDue,** Gen. Mgr. of Water and Sewage Treatment, Akron, Ohio, and Vice President of AWWA, **James E. Garrett,** Dept. of Pub. Works, Newark, and **E. D. Sheehan,** Supt. Water, Camden, presenting the practices in their respective cities.

Street Repairs

The session closed with a general discussion of Street Repairs. So successful had the earlier discussions been, that time was not left for the discussion of hydrant painting, and storage tank maintenance. (G.E.S.)

Streander Back in Circulation as Consulting Sanitary Engineer

Philip B. Streander, who for the past five years has been connected with The Stone and Webster Eng. Corpn., has recently returned to the sanitation field to re-establish a consulting practice in association with two established engineering firms.

Mr. Streander who will again specialize in water supply, distribution, treatment, sewer systems, sewage treatment, trade waste treatment, refuse disposal, etc., has established affiliation with engineering firms in Boston, Mass., and in Sharon Hill (Delaware Co.), Penna.

The Pennsylvania firm is Damon & Foster, and the Boston firm is Cleverdon, Varney & Pike of 120 Tremont St., Boston.

Mr. Streander will divide his time between the two firms which are augmenting their staffs in order to handle the increased volume of sanitary work which is already developing.

Should Pipe Coverings Require Inspection?*

Not long ago an interesting article on pipe insulation appeared in a prominent publication. This writer's attention was arrested particularly by the statement that pipe insulation should be inspected at rather frequent intervals, "contrary to the practice" of many users of insulation.

That statement caused the writer to wonder what an engineer friend of his would say about it—the chief engineer of a large concern that manufactures insulation. Knowing that it is not uncommon for some manufacturers to say regarding their product: "Install it and forget it," this question was put up to the chief engineer for an answer: "If the insulation were installed by you, s that statement true?"

It was the writer's guess that the statement would be ridiculed by the chief engineer and that he would say in effect, "Don't pay any attention to what that gentleman says. He doesn't know what he is talking about." Instead of that, this is what he wrote, which practically verifies the questioned statement.

"I never quarrel with a statement of that nature. Pipe covering in general is lucky to get any inspection, and if an article such as this makes the operator look at it once a year, all well and good. There is no such thing as too frequent inspection, from the manufacturers' point of view."

[We print Mr. Schaphorst's comments because we believe that a principle is involved—a principle that applies all down the line. Routine inspection has saved lives as well as dollars—a good thing to remember.—Ed.]

*Contributed by W. F. Schaphorst, M.E., Newark, N. J.

INDUSTRY CONVERTS SEWAGE WORKS EFFLUENT INTO WATER SUPPLY*

A Story of the Solution of an Industrial Water Supply Problem Through Cooperation of a Large City and an Important Industry

By WM. P. HILL
Engineer
BETHLEHEM STEEL CO.
SPARROWS POINT, MD.

THE SPARROWS Point plant of the Bethlehem Steel Co. is located at tidewater on a site 12 miles southeast of Baltimore, Md.

The Author

The problem of securing an adequate water supply has changed considerably since the construction of the first blast furnace on the banks of the tidal Patapsco River, over a half century ago. This location makes available an unlimited supply of water containing approximately 4000 ppm. of chloride ions, but this water has limits of use due to the high salt content. The daily pumpage of this brackish water is approximately 170,000,000 gallons.

*A paper read before the Maryland-Delaware Water and Sewage Works Association.

Until December, 1942, the only source of fresh water was artesian wells, 32 of which were in continuous operation, with capacities ranging from 200 to 900 gpm.

It has, of course, been necessary to use recirculating and cooling systems to conserve as much of the fresh water supply as possible. These systems circulate an average of 35,000,000 gallons per day, thus reducing the withdrawal from the underground reservoir by this amount.

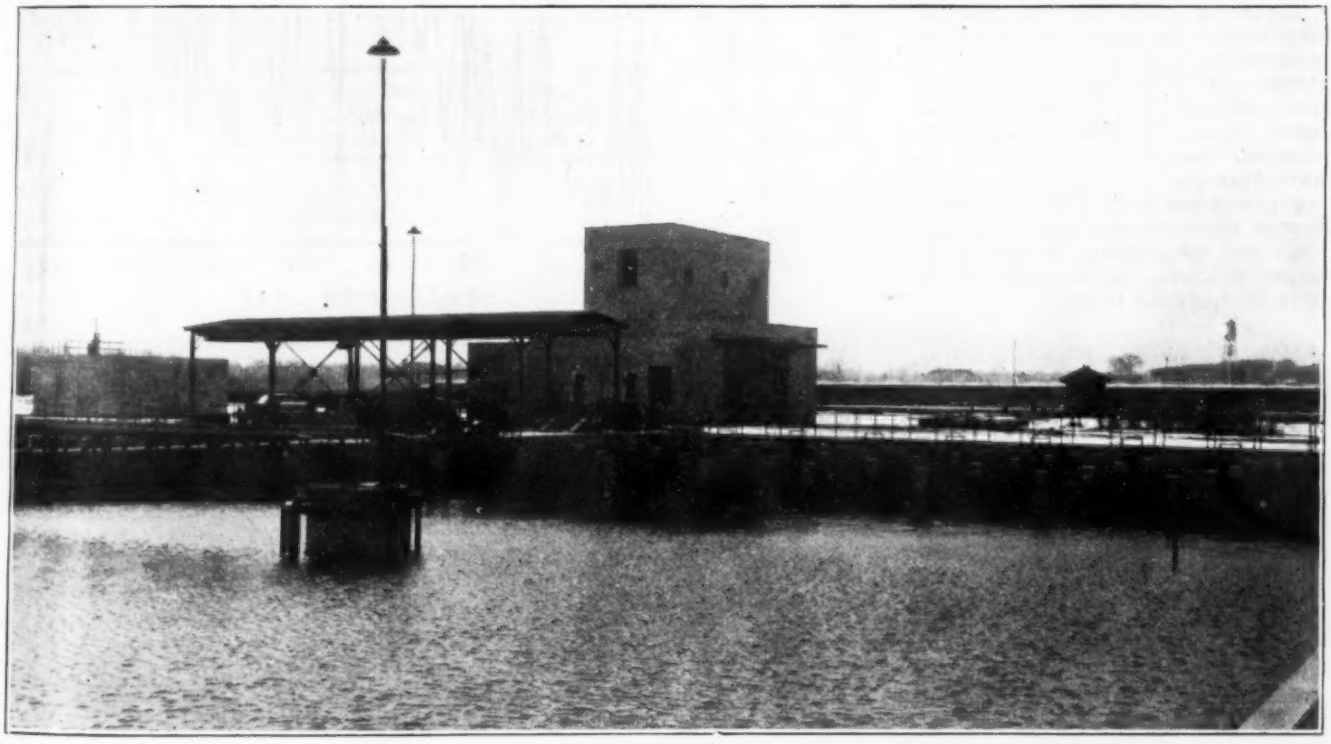
A large part of Baltimore's industrial area is supplied with water from the same underground reservoir. Recent study indicates that, due to rapid industrial expansion, the pumpage of ground water from this basin has reached approximately 50,000,000 gallons daily. The combination of the high rate of pumpage concentrated in this small area, and the improper construction, maintenance and plugging of wells has caused the piezometric surface to decline below its original level.

Many wells have become contaminated with salt or highly acid waters. It is now really a question if the withdrawal from the subterranean streams in the Baltimore area does not still exceed the replacement by rainfall, even though our pumpage from these strata has been reduced from more than 17,280,000 gallons per day, in 1942, to 7,000,000 gallons per day in 1943, by the development of the additional water supply to be described.

It should be noted that this 59 per cent reduction of well pumpage does not indicate the total usage of industrial water, since much of this new industrial water is now used for numerous processes where the inferior salt water was originally used.

Tables I and II show the trend of the static head in the Sparrows Point area.

It will be noted that prior to 1943 (when the new supply was introduced) there was a definite recession in the water tables in each of the strata. Concurrent with the recession in water



30 Mgd. Plant on City Property Treats Baltimore Sewage Works Effluent for Industrial Use at Sparrows Point, Md., by Bethlehem Steel Co.

Flocculation Units in Treatment Plant.
(Operated at 2.14 rpm. with peripheral speed of 0.9 ft. per sec.)

TABLE I

Depression of Water Level Below Ground Level at Sparrow's Point, Md.

Year	Depression in feet
1898	10 to 15
1903	24 to 29
1909	4 to 36
1913	8 to 45
1917	15 to 60
1930	50 to 97
1937	59 to 110

tables there was an increase in chloride content of the waters. Some wells that had no more than 5 to 15 ppm. of chloride in 1937-38 had chloride contents from 50 to 200 ppm. in 1941.

The fresh water problem was felt long before the war, and a regular program was put in operation for the purpose of correcting the contamination and depletion of the local fresh water supply. In 1940, however, the condition became critical due to the war effort and steps were taken to investigate other sources of fresh water to meet the increased needs of the steel plant and the shipyard, as well as the larger domestic requirements of the town of Sparrows Point.

Baltimore Sewage Works Effluent Selected as New Source of Supply

After the completion of an extensive study of all available sources of water in this area, the Baltimore City Sewage Disposal Plant effluent was selected as being the most promising. This plant, located on Back River, 5½ miles from Sparrow's Point, offered a continuous flow of the city's spent water supply with a minimum safe yield exceeding 85,000,000 gallons per day of purified sewage. In cooperation with the sewerage engineers of Baltimore, this potential supply was studied over a period of several months. At the same time, extensive tests were run in various mills at the steel plant, to determine the effect of water of this character on the operations and products.

It was found that the partly treated effluent could economically be reprocessed and used, except for periods of high chloride content, which ran as high as 600 ppm. under certain conditions of river level, industrial discharge and rain fall. Fig. 1 shows the trend of chlorides in the sewage effluent for a normal week in 1941.

The results of the tests conducted throughout the steel plant set the maximum upper limit for chlorides at 175 ppm. though a lower figure is desirable.

Once again the cooperation of the city engineers made possible a complete survey of the Baltimore sewer system, the purpose of which survey was to find means to eliminate or reduce the high peak chlorides, which, rather than the organic content or other salts such as nitrates, from the outset had been one of the most serious objections.

In studying the system it was found to consist of two general areas:—a high-level area and a low-level area.

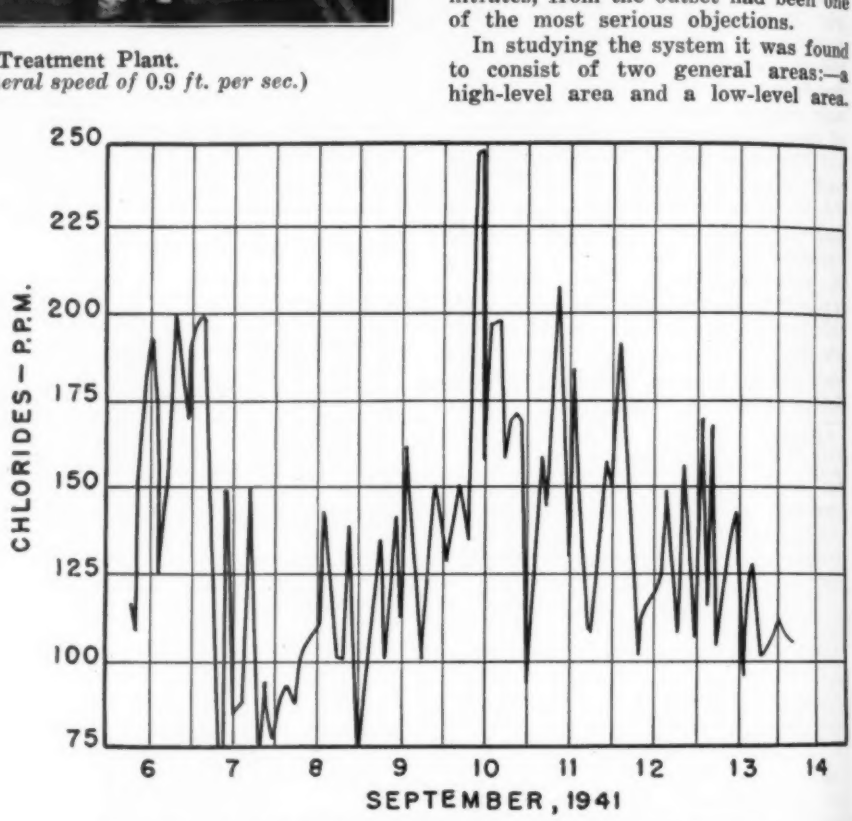


Fig. 1. Trend of Chlorides in Baltimore Sewage Effluent in 1941.
(Before Infiltration of Sea Water Was Reduced.)

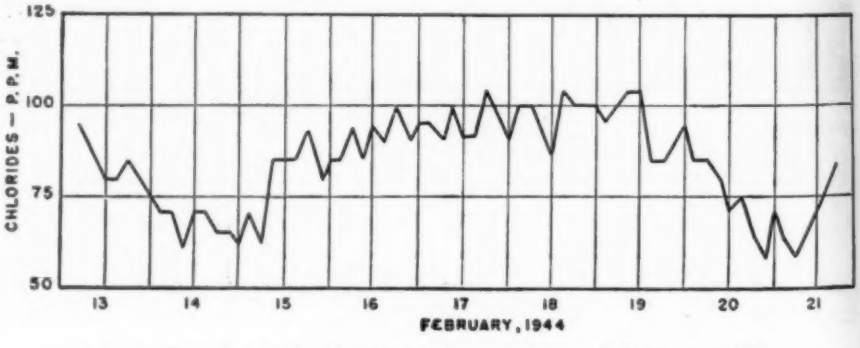


Fig. 2. Trend of Chlorides in Baltimore Sewage Effluent in 1944.
(Normal Week After Infiltration of Sea Water Was Reduced.)

The high-level area is mainly domestic sewage with a practically constant chloride concentration of 40 ppm. This sewage flows to the treatment plant by gravity.

In the low-level area, which takes in the majority of the industrial and business sections around the harbor, the sewage system is from three to ten feet below mean tide water. It was in this area that the high chloride sewage was found. By plotting tide level versus chloride concentration, it was found that in general the chloride content varied directly with the height of tide. This gave evidence that most of the contamination was from infiltration of harbor water, the chloride-ion content of which averaged 3000 ppm.

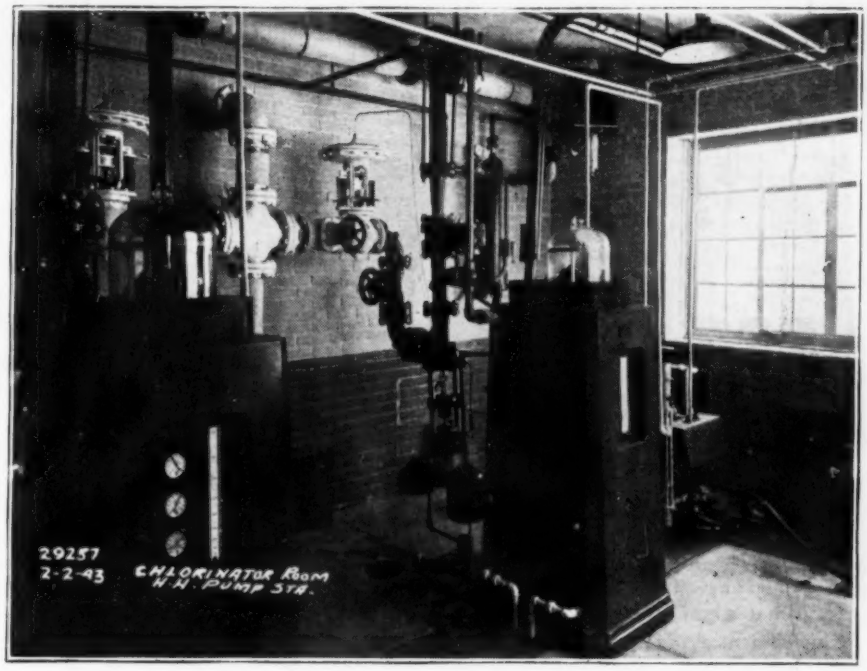
Locating Salt Water Infiltration

By sampling the sewage at various manholes along the interceptor it was found possible to locate many of the points of infiltration into the sewer between manholes, and also to trace the contamination directly to industrial plants such as soap manufacturing, meat packing and pickling, zeolite water softening plants, etc.

The distance between the manholes where an increase in the chloride content appeared was often from 300 to 400 feet. In order to explore the pipe line along its entire length, a small electrode was made to float on wooden blocks. The electrode was fastened to 500 ft. of two-strand rubber-covered cable. The conductivity of the sewage was read by using an alternating current Wheatstone bridge. As the chlorides in the sewage increased, the conductivity increased. By taking conductivity readings every few feet along the sewer the exact location of the high chloride contamination was found.

Here again the cooperation of the city engineers led to the repair of most of the leaks and made possible virtually complete elimination of the difficulties caused by the chloride contamination. Today the sewage averages less than 100 ppm. as shown in Fig. 2 which reveals the chloride trend during a normal week in 1944.

Laboratory tests were also being conducted on both the effluents from the activated sludge plant and the trickling filter plant serving Baltimore, these two plants being adjacent to each other at Back River. It was found that when the activated sludge plant, which has a designed capacity of 20,000,000 gpd., was operating in a stable condition the effluent had a turbidity of 5 to 12 ppm., a 5 day BOD. of 10 to 15 ppm., suspended solids of less than 10 ppm., a pH from 6.8 to 7.0, and a methyl orange alkalinity of 135

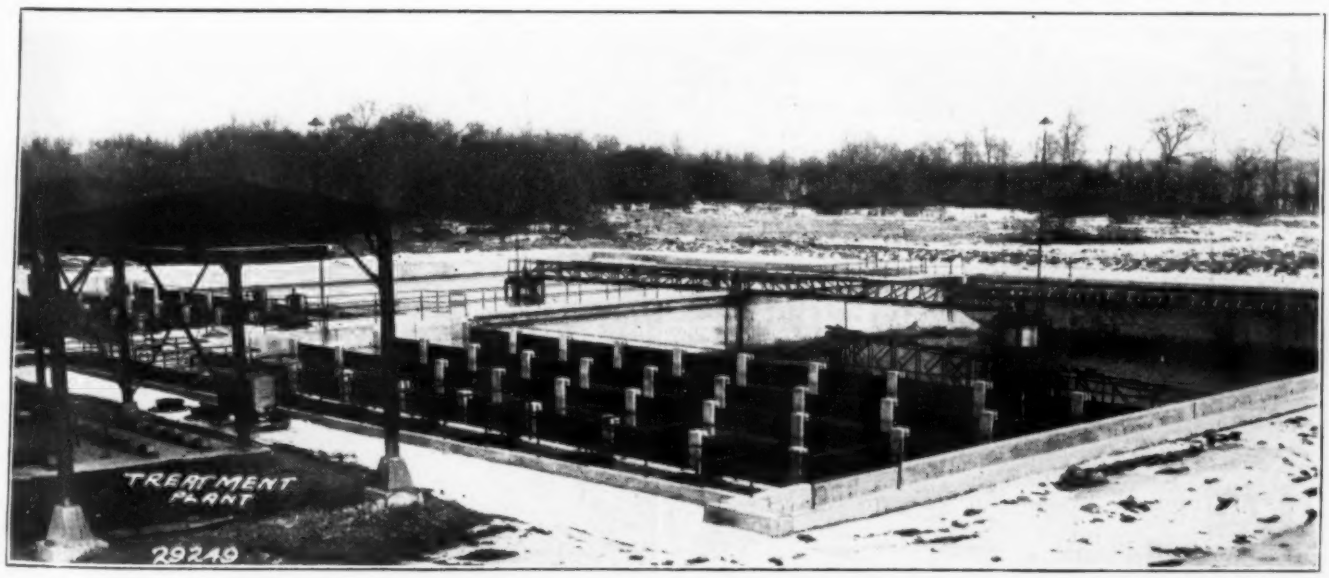


One of the Automatic Chlorinator Installations

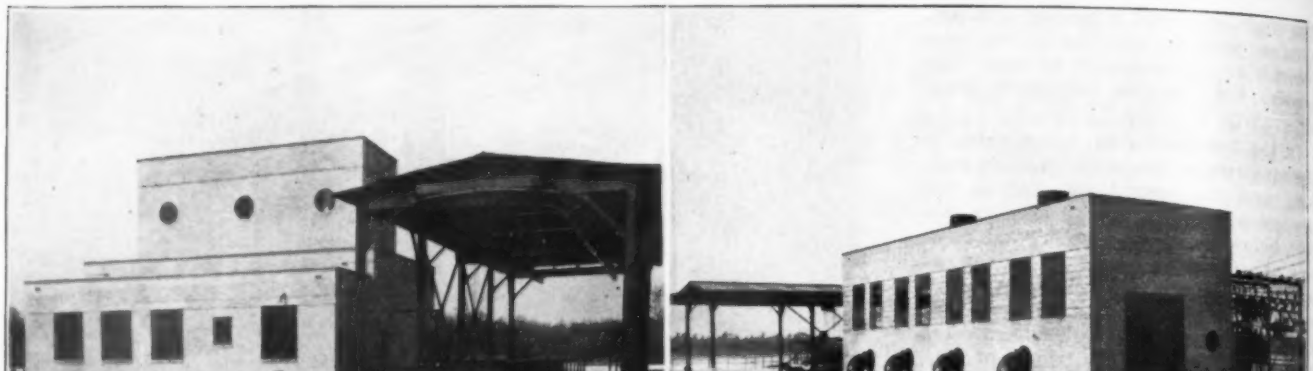
TABLE II

Depression of the Water Table in Feet Below Ground Water Level at Sparrows Point, Md.

Year	Depression in Feet 230 ft. strata min.	230 ft. strata max.	330 ft. strata min.	330 ft. strata max.	600 ft. strata min.	600 ft. strata max.
1938	85 ft.	117 ft.	92 ft.	110 ft.	103 ft.	140 ft.
1939	85 ft.	144 ft.	98 ft.	153 ft.	102 ft.	160 ft.
1940	89 ft.	144 ft.	131 ft.	196 ft.	135 ft.	160 ft.
1941	103 ft.	150 ft.	138 ft.	190 ft.	147 ft.	176 ft.
1942	110 ft.	160 ft.	155 ft.	200 ft.	141 ft.	160 ft.
1943	36 ft.	43 ft.	45 ft.	76 ft.	95 ft.	108 ft.
1944	39 ft.	45 ft.	47 ft.	57 ft.	97 ft.	110 ft.



View of Treatment Plant—Chlorine Shed Left; Flocculators Center, and Clarifiers Beyond



Left: Control House, Laboratories, Chemical House and Chlorine Shed of Treatment Plant. Right: High Head Pumping Station Delivering Treated Water from 90 Mil. Gal. Storage Reservoir.

ppm. This water would require no processing except chlorination for safety and algae control.

The effluent from the trickling filter plant has an average turbidity of 18-30 ppm., a BOD. of 50-90 ppm., suspended solids 25 ppm., pH 6.6 to 6.8 and a methyl orange alkalinity of 175 ppm. The effluents from both plants appeared to be very highly buffered.

Early tests showed approximately 4 grains per gallon of filter alum to be a suitable coagulant to produce a satisfactory effluent from efficient clarification tanks for steel plant industrial use. Many other coagulants, however, gave promising results, including a waste by-product from the steel plant itself.

Purification Plant for Converting Sewage Effluents

In view of the war emergency and the contemplated expansion of the Sparrows Point steel plant, a 50,000,000 gpd. industrial water supply system was designed. This consisted of a 30,000,000 gpd. treatment plant for trickling filter effluent and provisions for admitting normal activated sludge effluent directly into the transmission line without further purification other than chlorination. The activated sludge effluent can also be passed thru the treatment plant, which has proved very advantageous for many reasons. The effluent from each system is measured by Venturi meters as it enters the plant. The water now flows to an inlet chamber at which point the flow is divided. From this point on, all treatment units are in duplicate, flow through the plant being in parallel. Following the sewage plant effluent through one side (one-half) of the treatment plant to the point where it emerges as industrial water the following steps are noted:—

The coagulating chemical is added at the inlet to a flash mixer. Here chlorine is also applied when prechlorination is advantageous.

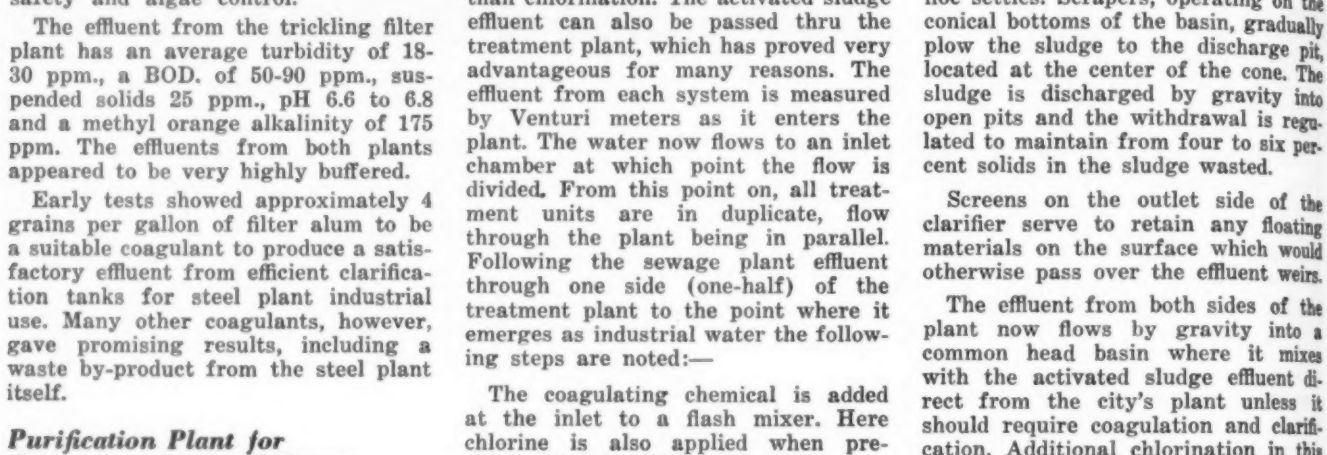
After sufficient agitation the effluent is discharged into a flume, gated properly, to give even distribution through four sets of horizontal shaft Dorr Flocculators. The flocculators are at present operated at constant speed of 2.14 rpm., giving a peripheral speed of 0.9 ft. per sec.

The water then flows through a square clarifying basin in which the floc settles. Scrapers, operating on the conical bottoms of the basin, gradually plow the sludge to the discharge pit, located at the center of the cone. The sludge is discharged by gravity into open pits and the withdrawal is regulated to maintain from four to six percent solids in the sludge wasted.

Screens on the outlet side of the clarifier serve to retain any floating materials on the surface which would otherwise pass over the effluent weirs.

The effluent from both sides of the plant now flows by gravity into a common head basin where it mixes with the activated sludge effluent direct from the city's plant unless it should require coagulation and clarification. Additional chlorination in this head basin gives a chlorine residual of 0.75 ppm. going to the mill at Sparrows Point.

The building housing the equipment is a two-story brick structure conforming with the present architectural design of the Baltimore Treatment Works. The chemicals are delivered by truck and dumped into receiving hop-



Left: High Head Pump Station Control Board. Right: Control Board of Treatment Plant, Located in Laboratory.

pers with two elevators to convey the material into the overhead storage bins. The chemical handling equipment is furnished with a central dust collecting system.

The coagulant passes by gravity from the storage bins into dry chemical feeders which continuously weigh out the material in proportion to the rate of flow of the effluent being treated. The dry chemical is spilled into small mixing tanks where water is added and from which the solution is picked up by water ejectors and piped to the point of application. There is also a dry feeder equipped with a lime slaker to be used if necessary.

Three variable-speed, reciprocating pumps handle the sludge. One centrifugal pump supplies water to the chemical tank and operates the water ejectors, one centrifugal pump feeds chlorine solution water, while a centrifugal sump pump removes drainage from the treatment plant basement. Two small air compressors operate in conjunction with the Venturi meters.

The heating plant is supplied by sludge digestion gas purchased from the city.

The first floor houses the chlorine treatment equipment station, the laboratory, meters and complete control board. The receiving hoppers are also on the first floor or ground level. The second floor houses the top of the elevators which discharge to each of the three 75-ton storage bins. The central dust collecting equipment is also located on the top floor.

60-Inch Supply Conduit

The combined effluent from this plant flows by gravity with a total differential head of 13 ft. through a 60-in. reinforced concrete pipe line, 24,000 feet long and running below the hydraulic gradient throughout its entire length. Automatic air relief valves are placed at the high points, and blow-off valves at the low points of the line. This 60-in. gravity line discharges into a 90,000,000 gallon reservoir with a water area of 41 acres.

A supply reservoir of this size was constructed for the purpose of eliminating the high chloride peaks by permitting the shutting down of the treatment plant during such peaks. It further guarantees a supply of water very close to the steel plant should anything happen to the long conduit. In addition there is a by-pass line around the reservoir, intended for use during any future cleaning of the reservoir and likewise for chemical control should such prove necessary.

High Head Pumping Station

A high head pumping station is located at the reservoir. This is equipped with traveling screens, two complete chlorinators, one 10,000 gpm. and two 15,000 gpm. centrifugal pumps, with a Venturi meter control of chlorine dosage in accordance with the flow. From this station the water is distributed thru reinforced concrete, cast iron, steel and asbestos pipe lines of graded sizes at a pressure of 55 pounds. There is a 750,000 gallon water tower located at approximately the center of the distribution system.

Precautions for Safety

Upon the advice of and with the cooperation of the Department of Health of the State of Maryland, a complete new water distribution system was installed for this strictly industrial supply. This system has no known connections with any existing potable water piping, nor with any wells or their related reservoirs, treating equipment, or piping.

To insure and maintain this separation, all "Industrial" and socalled "Town" water lines were coded, and a plan was instituted whereby it was necessary to prepare a special form requiring approval of work before any new piping can be laid or any alterations made in existing piping.

Successful Service Proven

This system was put into operation on December 5, 1942, and has been in continuous successful service ever since, averaging over 24,000,000 gallons per day of industrial water of the following analysis:

	ppm.
Residual chlorine*	0.25*
Chlorides	98
Turbidity	8
B.O.D	8.0
pH	6.9
Coliform organisms	(None in 5 ml. samples)

*Recorded at end of distribution lines.

There have been no more problems than anticipated in the treatment of the sewage works effluent. Plain alum was first used containing approximately 17 per cent alumina; however, this was later changed to socalled "activated alum" of approximately 16.4 per cent alumina content, and an excellent effluent has been maintained with a lower dosage of this type of filter alum which contains considerable insolubles. No lime has been used except on experimental tests.

Pre-chlorination is used seasonally to reduce "gassing-up" of sludge in the clarifiers and post-chlorination is used continuously at a rate sufficient to maintain a chlorine residual of approximately 0.35 ppm. at the high head pumping station when operating on the by-pass and not less than 0.25 ppm. throughout the distribution system. The reservoir is checked regularly for algae and when necessary it is treated with copper sulphate and chlorine. The water has always been free from odors except for occasional traces of chlorine.

The reduction in well pumpage in this area has brought about very encouraging results in the gradual recovery of the static head of the ground water and an increase in the quantity of water available from the same wells.

The Corrosion of Concrete

C. D. Parker, Senior Chemist and Bacteriologist, Research Laboratories of the Sewerage Branch of the Melbourne and Metropolitan Board of Works, has published two articles on The Corrosion of Concrete in *The Australian Journal of Experimental Biology and Medical Science*, Vol. 23, pp. 81-90 and 91-98 (1945). The work was carried out by the author as a part of a comprehensive investigation into the problem of the corrosion of sewer structures by hydrogen sulfide.

Pointing out in the first article that the corrosion of the internal surface of concrete sewers occurs only where the sewage or the sewer atmosphere contains an appreciable quantity of hydrogen sulfide, Mr. Parker emphasizes the fact that this corrosion occurs only above water level, with the most rapid corrosion being just above the daily high water level.

This widespread corrosion has shown to be caused by the production of sulfuric acid and the conversion of calcium, iron and magnesium salts to the sulfates, but no adequate explanation of the mechanism of the acid production has been made.

The first paper describes the isolation of a species of bacterium from the corrosion products and its physiological and biochemical properties. Based on experimental work, Mr. Parker proposed the name *Thiobacillus concretivorus* for the species of bacteria isolated from corroded concrete, and the five strains studied were considered to be five separate strains belonging to the one species.

The activity of this species of bacteria explains the production of free sulfuric acid in the corrosion process, provided free sulfur or some utilizable form of sulfur is first formed from the sulfide gas (H_2S).

In the second paper, Mr. Parker described experiments with pure cultures of *Th. concretivorus*. These experiments have revealed the following: (1) Concrete in sterile solutions does not corrode in the presence of H_2S. (2) The corrosion process may be divided into two stages. The first or preliminary stage is that in which the carbonate-bicarbonate-CO_2 equilibrium is destroyed and the pH of the concrete falls from 8.4 to between 6 and 7. The final stage is that in which active proliferation and acid formation by *Th. concretivorus* takes place. (3) Bacteria do not induce the first stage, but cause the active corrosion in the second stage. (4) The cause of the first stage was not discovered; it apparently requires 18 to 24 months unless artificially induced. (5) *Th. concretivorus* does not utilize H_2S directly but converts free sulfur into sulfuric acid. However, this organism did utilize some other utilizable form of sulfur which was probably produced non-biologically.

FEATURES OF CONTRACTUAL AGREEMENT FOR USE OF SEWAGE EFFLUENT AS INDUSTRIAL WATER*

A Review of Conditions and Rate Schedules Contained in Agreement Between City of Baltimore and Bethehem Steel Co.

By NORMAN D. KENNY
Consulting Engineer
WHITMAN, REQUARDT AND ASSOCIATES
BALTIMORE, MD.

A PHASE of the utilization of sewage works effluent as an industrial water supply that has not been covered in Mr. Hills' paper (see preceding article in this issue) is the contractual agreement that has been entered into between the Mayor and City Council of Baltimore, Md., and the Bethlehem Steel Co. I shall endeavor to present an abstract review of this important agreement. No attempt will be made to include in this discussion the several legalistically drawn clauses, and safeguarding statements which the agreement contains. However, all important features of the agreement will be reviewed and discussed.

The Author

* A review of the Agreement as presented before the Maryland - Delaware Water and Sewage Works Ass'n by the author in a discussion of the preceding paper by Wm. P. Hill.

Dr. Abel Wolman of Baltimore served as consulting engineer to the Bethlehem Steel Co. on this project. After studying all potential sources of industrial water supply he recommended utilization of the effluent from the sewage treatment works of Baltimore. He also developed the treatment process used by the company and the program, and continues as adviser on plant operation.

My position in this project was that of being directly in charge of design and construction as a representative of the consulting engineers. However, in presenting this discussion it is to be understood that I speak as an individual and not for the Bethlehem Steel Co.

Before starting discussion it should be emphasized again that the Back River Sewage Treatment Works produces secondary effluent from two sources.

(a) From a trickling filter plant which has a capacity of about 90 million gallons per day, and
(b) From an activated sludge plant which has a rated capacity of 20 million gallons per day.

From the viewpoint of the Bethlehem Steel Co. the activated sludge plant effluent is much preferable in that normally when the plant is functioning properly, no chemical treatment is required for the effluent except chlorination. On the other hand, the liquid from the secondary tanks of the trickling filter system requires alum precipitation involving a dosage of 4 grains or more per gallon, plus chlorination. The wording of the agreement when studied in detail will seem to be in reverse, unless one has the above background thoroughly in mind.

Features of the Agreement

The agreement begins with the background statement to the effect that the City of Baltimore has a Treatment Works at Back River and that it is estimated that an average flow of 90,000,000 gallons per day of effluent is at present being discharged into the waters of Back River. The fact that "Heretofore this effluent has had no utility value whatsoever and has been without commercial value," is an important statement in the agreement and is therefore here quoted.

Chemical Feed Room—Effluent Treatment Plant Producing Industrial Water for Bethlehem Steel Co.

The agreement then states that the Company has a plant at Sparrows Point, Md. In the background phrasing it is stated: "The Company requires for industrial purposes a larger supply of water than is now available to it. The Company believes that by appropriate treatment the effluent now being discharged by the City into Back River can be converted into water suitable for certain industrial uses and has expressed its desire to enter into an agreement with the City whereby a substantial portion of such effluent will be made available for that purpose."

The Agreement will now be reviewed and discussed by sections:

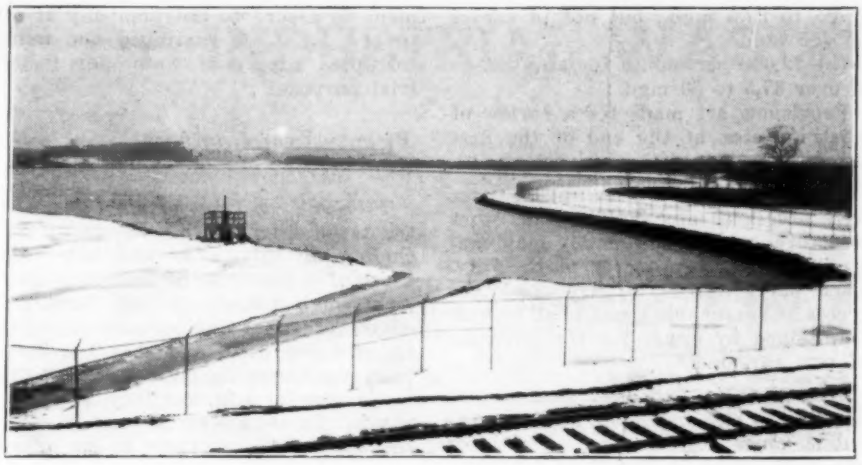
FIRST: By agreement the City expresses willingness and intent to deliver to the Company such quantites of sewage plant effluent as the Company may require, but not in excess of the rate of 50,000,000 gallons per day. The agreement is so phrased that the Company may elect to take the activated sludge effluent as far as practicable, but without binding the City to use that particular type of treatment. Nevertheless, "The City agrees, however, to operate the activated sludge unit whenever, in the opinion of the Chief Engineer of the City, it is practicable to do so."

The City reserves the right to use any quantity desired of this treated sewage for its own particular purposes but the agreement states "the purpose of this agreement being to give the Company a prior right, to the extent hereinbefore provided, to take the effluent actually so discharged."

SECOND: Delivery points are to be selected by the Chief Engineer of the City after consultation with the Chief Engineer of the Bethlehem Steel Co.

Quality of Effluent

THIRD: The City agrees to make every practicable effort so that the delivered effluent shall have the following characteristics:



90,000,000 Gal. Industrial Water Supply Reservoir of Treated Sewage Effluent.

(a) The pH value of the effluent shall not exceed 7.8 or fall below 6.5.

(b) The total suspended solids in effluent from the activated sludge plant shall not exceed an instantaneous maximum of 50 ppm. and the monthly average of such solids shall not exceed 25 ppm. With reference to the effluent from the trickling filter system the suspended solids shall not exceed an instantaneous maximum of 80 ppm., or a monthly average of 50 ppm.

(c) The 5-day BOD of effluent from the activated sludge plant shall not exceed an instantaneous maximum of 45 ppm., and the monthly average shall not exceed 25 ppm. The requirements for the effluent from the trickling filter are that an instantaneous maximum of 80 ppm. BOD. or a monthly average of 40 ppm. shall not be exceeded.

(d) The chloride content shall not exceed 175 ppm.

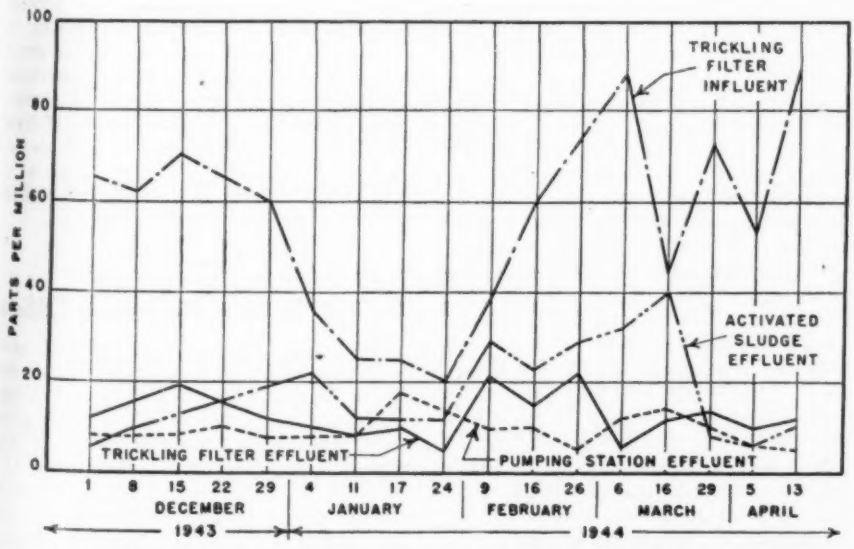
Samples of effluents are to be collected and analyses made by the Company. The time of testing is to be such that an overall average is secured. On days when samples are to be taken, such are to be taken hourly and a 24-hour composite is to be made from the individual samplings compounded proportionately to the flow at the time of each sampling.

The Company is to notify the City of results of such analyses. If the City is not satisfied to accept these results the State Board of Health becomes the final arbitrator.

FOURTH: The Company is allowed to build *upon City property* "such processing plants, pumping stations, chlorinator houses, measuring devices, pipe lines, reservoirs and other facilities, as may in the opinion of the Company be necessary or advisable." The agreement further states that for the purpose of conducting such operations or construction, and in maintaining such facilities, the Company shall have access at all reasonable times to the property of the City. This constitutes a very liberal and cooperative attitude on the part of the City.

As is only natural the City reserves the right or privilege of reviewing and approving plans and specifications for any and all construction to be performed upon its property.

FIFTH: Another provision showing cooperation on the part of the City is to the effect that improvements or reconstruction of existing facilities may be made to the property of the City with the written consent of the Chief Engineer of the City; and that the cost of these improvements may be paid by the Company, but reimbursable to the Company thereafter, from fees that are to be paid the City for effluent in accordance with the standards set up further on in the agreement.



Graph of BOD Values of Activated and Trickling Filter Effluents, and Resultant Industrial Water (Pumping Sta. Effluent) After Treatment.

Rate Schedules

SIXTH: For the sum of one hundred and fifty dollars ($150) per month the City agrees to dispose of any and all sludge produced as a part of the treatment operations by the Company.

SEVENTH: For a ten-year period following January 1, 1942, the following block payments are to prevail:

(a) $1,000 per month for any quantity of effluent less than 25 mgd.

(b) $1,500 per month for an average

of 25 to 37.5 mgd., but not in excess of 37.5 mgd.

(c) $2,000 per month for an average of over 37.5 to 50 mgd.

Provisions are made for a review of existing rates at the end of the first ten-year period of the agreement.

EIGHTH: The City shall at all times have access to any buildings or other structures which the Compay may construct upon the property of the City. Each party agrees to give the other access at reasonable times to all records maintained by either for the purposes of this agreement.

NINTH: The Company shall not be required to pay any taxes, assessments, public dues or charges levied or assessed, or to be levied or assessed, on the land of the City hereinbefore referred to, on which the Company has constructed treatment and delivery facilities.

TENTH: The Company agrees that it will hold the City harmless against any liability for any nuisance created by the Company; except that the Company shall not be liable to the City in such cases where any act or omission by the City shall contribute to the thing done.

Adjustment for Poor Effluent

ELEVENTH: For any month during which the effluent delivered by the City does not meet the physical standards previously set forth, the Company shall not be required to make full payments specified by the SEVENTH article, but shall pay to the City the sum of not less than $500 per month. The Company shall have no right to any other remedy because of such failure of the City to deliver effluent in quantity and/or quality specified.

Another phrase of this particular Article (11) is to the effect that it is a fundamental purpose of this agreement to assure to the Company at all times.....a continued and uninterrupted supply of water for industrial purposes.

Twenty Year Contract Renewable

TWELFTH: This section deals with the termination of the Contract. Excluding all "ifs, ands and buts" the sense of it seems to be that the agreement shall remain in full force and effect for twenty (20) years following its effective date, and that the Company shall have the right to renew this agreement for a further term of twenty years. In the event of such renewal the terms and conditions of the agreement are not to be altered except that the rates applying to the monthly payments may be subject to revision.

THIRTEENTH: This section deals with arbitration of disputes, and need not be discussed here.

FOURTEENTH, FIFTEENTH, SIXTEENTH AND SEVENTEENTH: These Articles do not have any point in this particular discussion.

EIGHTEENTH: The City gives the right to the Company to purchase pure City water from the Bureau of Sewers at a point near the Company's industrial water treatment works at Back River. This water has already passed through the water meter serving the sewage treatment works. The Company is to reimburse the City for the amount actually used at the rate paid to the Water Department by the Bureau of Sewers, plus ten per cent for overhead expenses.

The City does not take liability for adequacy of the pure water supply and the right is given to the Company to construct water pipes to the supply mains of the Baltimore County Metropolitan District, approximately one mile away.

Sale of Digester Gas

NINETEENTH: The City sells its by-product digester gas to the Company. This gas is used for fuel to provide heat and hot water for the chemical building. It is metered and the Company pays to the City two cents per hundred cu. ft. of sludge gas used.

TWENTIETH: Due to the critical material situation at the time of plant construction the problem of securing electricity at the plant was quite involved. To summarize: power was purchased from the Consolidated Gas and Electric Company by tapping the power company's lines just ahead of the City's Back River sub-station. The City gave permission to run electric cable into the duct system wherever it was feasible for the Company to use same. The Company pays the City at the rate of 6.3c per linear duct foot per year for the portions of the City's ducts so used.

TWENTY-FIRST: For the purpose of measuring sludge sent from the Company's treatment works to the City sludge digestion system, a Kennison nozzle with recording instrument was installed in one of the City buildings at the expense of the Company. The Company is to provide charts and ink as may be necessary. The City provides electric power and has the charts changed weekly. These charts are the property of the City.

The above summarizes the more important points covered by the written agreement between the City of Baltimore and the Bethlehem Steel Co.

My feeling is that it shows a high degree of cooperation and understanding of the problem of each other upon the part of both parties. The Bethlehem Steel Co. has been securing industrial water from the City since December, 1942, and the operation has had a fair period of trial. Results seem satisfactory to all concerned.

Dr. Frank Hale Retires

Director of N. Y. Water Laboratories for 32 Years.

Dr. Frank E. Hale, Director of Laboratories, Dept. of Water Supply, Gas, and Electricity of New York City, retired after 32 years in that position on Oct. 31. Prior to becoming director, Dr. Hale was chemist in charge for seven years and chemist for three years before that, making a total service period of 42 years.

Dr. Frank E. Hale

A native of Brooklyn, Dr. Hale was born in 1875 and was educated at Yale University, receiving an A.B. in 1900 and a Ph.D. in 1902. While attending the graduate school, Dr. Hale was an assistant in chemistry, and was elected to Phi Beta Kappa and Sigma Xi honorary fraternities.

A member of several associations and societies including AWWA, NEWWA, ACS, APHA, AICS, and Assoc. of Mun. Chem., Dr. Hale has written and published more than a hundred papers before these various societies. For three of his papers he has received awards, The Municipal Engineers of New York Annual Prize in 1919, the Dexter Brackett Memorial Award of NEWWA in 1930, and the John M. Goodell Prize of AWWA in 1935. In addition to these honors, Dr. Hale served as chairman of the Purification Division of AWWA in 1929-30.

Dr. Hale's name has been almost synonomous with that of the Mt. Prospect Laboratory of the New York Water Supply, although the branch laboratories at Mt. Kisco and Ashokan Reservoir were under his direction as well, and he was responsible for general supervision over the maintenance of quality of water delivered to the great city of New York. This supervision included private water supplies operating within the corporate limits of New York City. On the day before his retirement, Dr. Hale was honored at a dinner, given by more than a hundred of his friends and fellow workers.

B.S.H. Baker Reopens Office

B. S. H. Baker, who for the past several years has been a member of the New Jersey State Water Policy Commission, has terminated his association with that body and has reopened his Engineering and Land Surveying Office at 24 Beechwood Road, Summit, N. J. As in the past, Mr. Baker will specialize in Municipal Service, Structural, Sanitary and Hydraulic Engineering.

THE DISPOSAL OF INDUSTRIAL WASTES*

By
GEORGE E. SYMONS, PH.D.
Associate Editor
WATER WORKS & SEWERAGE
NEW YORK, N. Y.

WITHIN the last several years, the subject of industrial wastes and their disposal has reached a place of highest importance in sanitary engineering. It appears likely that in the post-war period, the disposal of industrial wastes will be the leading topic, although completion of a sanitary program for the entire country will also occupy considerable attention.

This changing attitude, from complete indifference a number of years ago to one of paramount interest, has probably been accelerated by the war, but the work of the U. S. Public Health Service on the Ohio River Pollution Survey and of various stream control commissions has contributed greatly to this interest. Recent evidences of this interest have included industrial advertising in trade papers, research programs of trade associations, the Purdue Waste Utilization Conference and the Federation of Sewage Works Association's programs, emphasizing industrial waste treatment and disposal.

The complex and varied problems of industrial waste disposal cannot be covered in detail in a single paper. Therefore this paper will approach the subject from its broader aspects and emphasize some generalities not usually presented in papers dealing with specific details of definite wastes.

Amount and Sources of Waste

The word *disposal* which means "to get rid of" may mean with or without treatment, and any general discussion must consider that meaning. Such a discussion must also include consideration of the whys and wherefores of these wastes as well as the whence and what.

Obviously, if industry uses water in its processes, one may expect the water to become contaminated, and it is this contamination which must receive treatment or else impose a pollution load on the receiving body of water.

That industry does use tremendous quantities of water is evident from Table I. These data taken from a compilation by Alex C. Burr,[1, 2] Dir. N. Dak. Research Foundation, are not meant to be mathematical averages. They are illustrative of the large quantities of water used in these types of industry. In many cases, much of these volumes of water will be uncontaminated (cooling waters especially) but in others, practically all of the water is polluted.

Classification of Wastes

The quantities listed in Table I, not only emphasize the amount but they emphasize the problem of disposal. While the listing offers one means of classifying industrial wastes, Eldridge[4] has classified industrial wastes as Organic, Toxic, and Inert. Wise[3] likewise has classified wastes according to occurrence, but from the standpoint of treatment, wastes may be classified as Organic, Inorganic, and Mixed. This has been done in Table II. Mixed wastes containing both organic and inorganic compounds, outnumber those predominantly either organic or inorganic in nature.

Inorganic wastes generally may be expected to require chemical or mechanical treatment, or both, and will not generally respond to biological treatment. Organic wastes will respond to biological treatment and many may or may not require chemical and mechanical treatment as well for complete purification. Mixed wastes may, and probably will, require both mechanical and chemical treatment as well as biological treatment, with special attention to the various problems and treatment phases involved.

Generally speaking, Mr. Eldridge's Toxic wastes fall into the Inorganic class, while his Organic wastes embrace most of those listed in Table II as Mixed.

TABLE II

Classification of Industrial Wastes
(Not Complete)

Inorganic	Organic	Mixed
Metallurgical	Vegetable Canning	Textile
Brass & Copper	Corn Products	Dyeing
Iron & Steel	Alcohol Production	Coke & Gas Wastes
Plating	Slaughter House	Paper Board & Allied
Sulfur	Dairy & Milk	Laundry
Sand Washing	Beet Sugar	Tanning
Acid Mfg.	Citrus Fruit Canning	Cutting Oils
Salts	Brewery	Dye Mfg.
Alkalies	Meat Packing	Petroleum
Coal Mines		Plastics
		Rubber Reclaiming
		Nat. & Synthetic Rubber
		Explosives
		Vegetable Dehydration
		Wool Scouring

The Economics of Waste Disposal

When industrial production was small the disposal of wastes by dilution was the simple answer. With the growth of industry the capacity of streams to receive and purify these wastes was overtaxed. Streams, formerly the source of fish, and available for pleasure, became fouled and an economic liability to the region. At the same time losses from industry became an economic factor with which to reckon.

True, not all waste substances discharged are recoverable or have an economic value; on the other hand, the economic loss to some industries is evident. Dr. C. S. Boruff,[6] Tech. Dir. of Hiram Walker and Sons, Inc., estimates

* Based on a talk given before the Niagara County Chapter of the N. Y. Society of Professional Engineers.

TABLE I

Abridged List of Industrial Water Requirements

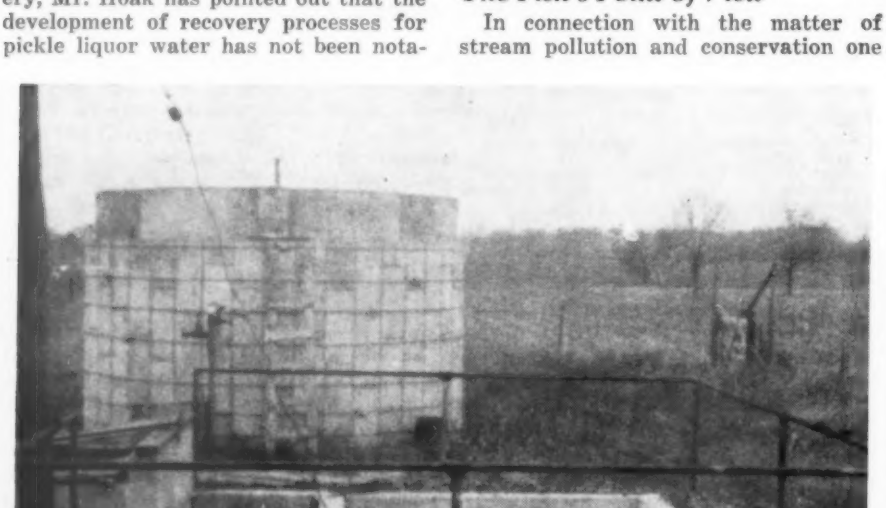
Industry	Gallons of Water per Unit of Production
Chemical Industries	
Corn Refinery	333 per ton of starch
Alcohol	20,000 " ton of grain
$(NH_4)_2SO_4$	200,000 " ton
Gun Powder	200,000 " ton
Lactose	220,000 " ton
Hydrogen	660,000 " ton
Food Industries	
Beet Sugar	20,000-25,000 per ton of sugar
Canning	300-25,000 " 100 cases of No. 2 cans
Meat Packing	16,000-55,000 " 100 live units
Milk Products	200- 250 " 100 lb.
Vegetable Dehydration	500- 2,000 " 100 lb.
Textile Industries	
Cotton	1,000- 3,800 per 100 lb.
Linen	10,000 " 100 lb.
Rayon	8,000-10,000 " 100 lb.
Wool Scour	2,000-12,000 " 100 lb.
Miscellaneous	
Air Conditioning	6,000-15,000 per person per season
Oil Field	18,000 " 100 bbl. crude
Oil Refinery	77,000 " 100 bbl. crude
Steel	20,000-35,000 " ton
Sulfur	3,000 " ton

that prior to the war the loss from the distilling industry was some 1,000,000 tons per year of recoverable materials worth $30 a ton.

Dr. Harry Gehm,[8] Tech. Advisor of the National Council for Stream Improvement, has estimated from U. S. Dept. of Agriculture data that the annual economic loss to the pulp, paper, and allied industries is $45,000,000.

Richard D. Hoak,[7] Senior Fellow of Mellon Institute, has been working for several years on the problem of pickle liquor disposal from the steel industry and estimates the annual loss of sulfuric acid at 125,000 tons besides a loss of 500,000 tons of ferrous sulfate. Some ferrous sulfate (copperas) is recovered, but this recovery is little more than five per cent of that lost.

In the matter of economies of recovery, Mr. Hoak has pointed out that the development of recovery processes for pickle liquor water has not been notable, mainly because of the low value and limited markets for compounds prepared from it. The treatment of pickle liquor is no longer a technical problem, but rather a problem in economics.



Slaughter House Waste Treatment Plant at Owosso, Mich.
Holding and Settling Tanks, Foreground; Recirculating Filter in Rear
(Courtesy E. F. Eldridge, Mich. State Agr. College)

One of the sanest attitudes on the economics of waste disposal versus by-product recovery has been expressed by Major Maurice Le Bosquet,[3] Sanitary Engineer, Div. of Water and Sanitation Investigations of the U. S. Public Health Service. These remarks bear repeating:

"I believe that an erroneous impression is created through the use of the phrases 'Economic loss from industrial wastes' and 'Value of recoverable waste products.' Such terms infer that industry, as a rule, is quite careless and accustomed to discharging materials of value into the sewer. Such instances are the exception rather than the rule and are usually found at the industry that does not sample its own sewers.

"It is true that there may be some value in the contents of industrial wastes, but, in the typical industry, this value is somewhat less than the cost of recovery. It is my feeling that while there remain further possibilities along the line of developing by-products, industry must first conduct extensive studies leading toward development of recovery processes and, in many cases, must also develop the markets to absorb the by-products after they become available.

"Many industries now realize that they are confronted with an item of expense in abating pollution, even though part of this expense may come back through the sale of by-products. In the future, I believe all industries will come to this realization."

The Fish's Point of View

In connection with the matter of stream pollution and conservation one should consider, too, the point of view of the fish. This has been quite ably done by Dr. M. M. Ellis,[9] Sr. Aquatic Physiologist, U. S. Dept. of Interior, in his paper presented before the First Purdue Industrial Waste Utilization Conference and published in *Water Works and Sewerage* for May, 1945. Some of the highlights of Dr. Ellis' paper can well be briefed here since they are so pertinent to this general discussion.

From the fish's point of view wastes may be classified as

(1) Suspensoids which blanket the bottom or the surface
(2) Oxygen-demanding substances
(3) Compounds altering the pH
(4) Compounds altering the salinity
(5) Specifically toxic substances

Bottom blankets may be caused by wood fibre, sawdust, paper pulp, rock powder, mine slimes, mud, oil wastes and sewage sludge.

When considering oxygen-demanding wastes, average data must not be considered as the criteria, because while the dissolved oxygen concentration may not be low enough to cause the fish's death, the sub-normal tension may seriously affect the normal living and reproduction functions of the fish.

While a pH below 5.0 or above 9.0 is usually lethal, high temperature and low oxygen concentration will narrow these limits.

Salts, brines, and oil wastes are particularly lethal when entering waterways in slugs. Specific toxins include cyanides, phenols, nitro-benzenes, and metal salts.

It is not always the case that the poison kills the fish directly; it may effect some organism in the biological cycle which depletes or destroys the food and thus the fish dies from lack of food (starvation) rather than poisoning.

POLLUTION ABATEMENT PROGRAMS

Two factors are paramount in the consideration or development of pollution abatement programs. First, to strike an economic balance between the extent of abatement and the capacity of the receiving body of water. Secondly, to develop individual abatement programs on a regional or drainage basin basis.

The development of pollution abatement programs has generally been by governmental action; i.e., municipal, state, regional, or Federal departments of health and conservation. Industry, however, has undertaken programs that are designed to lead to the solution of the problems. Two notable examples are the American Iron and Steel Institute, which for several years has been studying the problem of waste pickle liquor at Mellon Institute, and The National Council for Stream Improvement which last year organized a program of study of paper and pulp wastes.

This latter program has been set forth by Dr. Harry Gehm[8]:

"In attacking its waste problem, the pulp, paper and paperboard industry arrived at the stage where coordinated effort is imperative. Before any large-scale laboratory projects can be initiated, information must be collected and assembled on:

1. Sanitary analysis of the drainage areas involved.
2. An investigation of prior art.
3. Industry's experience with treatment and recovery processes.
4. An assembly and analysis of the physical and chemical characteristics of the wastes involved in the manufacture of all grades of paper and paper board.

"When research results have reached the stage where they are ready for application by the industries, such data will be made available through the chairmen of the various regional groups. Assistance in applying the knowledge obtained will be rendered

by the staff and such members of the research organizations as may be indicated."

Cost of Abatement Programs

The cost of industrial waste treatment to abate pollution in America will not be small. Research programs as outlined above will, themselves, require considerable expenditures.

A survey of industrial waste pollution in any drainage basin by a governmental agency likewise is not inexpensive, considering the necessity for investigation of individual industries, collecting and analyzing samples of various industrial waste and compiling data and information thereon.

The most recent large survey was the Ohio Stream Pollution Survey of the U. S. Public Health Service from its Cincinnati office. About the extent and cost of this survey Maj. LeBosquet[8] writes, "The complete Ohio River Pollution Survey and report cost about $600,000, of which about half was devoted to laboratory studies of the streams and half was devoted to collecting information on methods of sewage and industrial waste disposal and the preparation of the final report.

"The problem of collecting information on industrial wastes, including the preparation of Industrial Waste Guides, required more time than the problem of sewage disposal, so that possibly $200,000 was spent on the question of industrial wastes. This is about $100 per industrial plant included. The industrial waste investigations, however, did not include sampling and gauging studies, except in perhaps 20 cases. A sampling and gauging study might cost from $1000 to $2000 for one industry, depending on the complexity of the industry and the number of sewers involved."

Realizing that even the investigation of stream pollution will entail the expenditure of appreciable sums of money, one may well ask, what post-war future exists for industrial waste treatment. How large is the construction job of remedial measures to abate pollution? Three sources of information are available to give some idea of the financial expenditure involved in a comprehensive waste disposal program. These are the National Resources Committee publications "Water Pollution in the United States"[10], the report on "Ohio River Pollutional Control"[11] and the "National Inventory of Needs for Sanitation Facilities."[12]

The estimate for a comprehensive waste disposal program, first given in the National Resources Committee publication, is between $800,000,000 and $900,000,000, the annual cost being $200,000,000 to $250,000,000. The estimate is intended to be complete and to include disposal or treatment measures in industries not now generally practicing corrective measures. For example, in certain cases evaporation is assumed, whereas there are no evaporating plants installed at the present time. The estimate does not include any item of cost for rearranging sewer systems within industrial plants. This in itself might double the figure, as one instance has been recorded where an industry spent $250,000 simply for rearranging its sewer system in order to install phenol recovery facilities.

The most recent estimate on industrial waste pollution abatement costs was published in the U. S. Public Health Reports,[13] July 7, 1944.

The estimate is based largely on an expansion of the Ohio River Pollution Survey detailed data to cover the country as a whole. Estimated costs of independent industrial waste corrective measures total $160,000,000. In addition, the increased costs of municipal treatment works because of industrial wastes contributed to municipal sewer systems total $153,000,000, making the total cost of industrial waste disposal $313,000,000.

Corrective measures are confined to those which can be taken now with present knowledge and do not include corrective measures which cannot be taken until after extensive studies have been made in regard to methods to be used. The estimate does not include the cost of rearranging sewer systems preliminary to installing treatment works or other corrective measures.

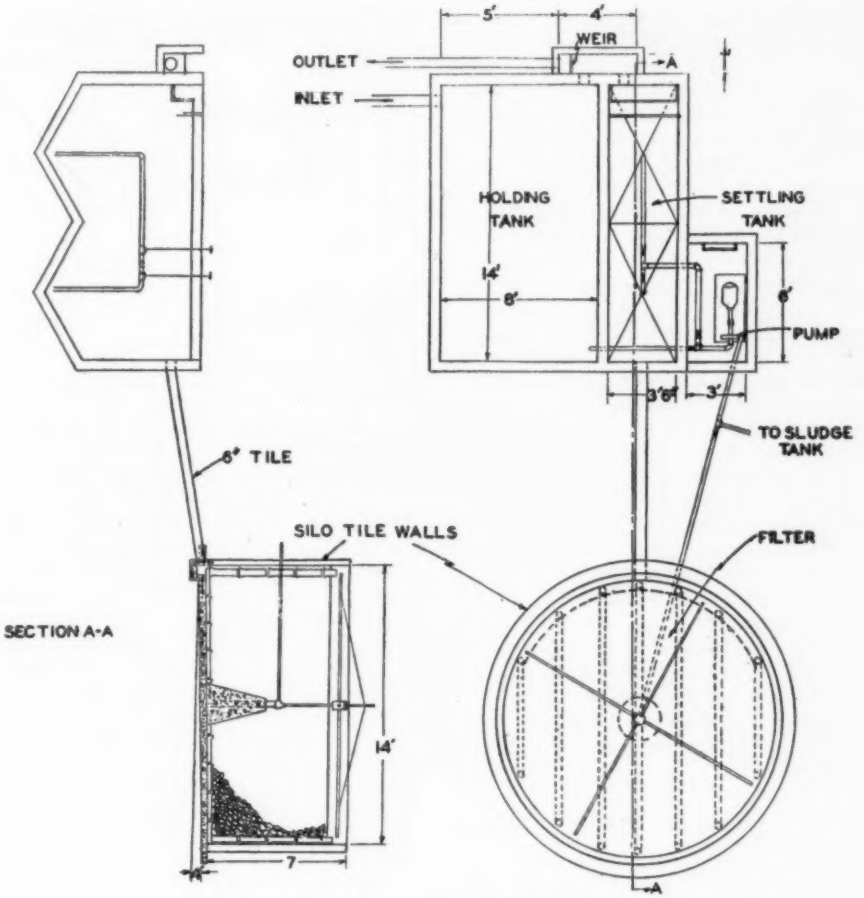
As Maj. LeBosquet points out[8] this estimate of $313,000,000 is restricted and therefore should not be considered as at wide variance with the $900,000,000 estimate of the Nat. Resources Committee.

If one may estimate a similar per capita expenditure in Canada, then it becomes obvious that the construction of industrial pollution abatement equipment may run for a period of years in the post-war period with expenditures of 75 to 100 million dollars a year.

Specific Waste Problems

In a general survey of the broad picture of industrial waste disposal, it is, perhaps, a mistake to attempt any mention of specific wastes, to the exclusion of others. On the other hand, it seems wise to call attention to the complexities of at least two waste problems. For example, the paper and pulp waste is quite complex because this waste problem really involves several different wastes, as is evident from Table III, furnished by Dr. Harry Gehm[6].

Another example of the complexity of wastes is the canning industry. About this seasonal and highly varied industry, Wm. A. Ryan,[13] Industrial Waste Consultant of Rochester, N. Y., writes: "Wastes from vegetables and fruits are chiefly organic in nature with small amounts of dirt or mineral matter from the washing process. Vegtables canned include tomatoes, corn, peas, beans, beets and cabbage, etc.



Details of Owosso Slaughter House Waste Treatment Plant

Fruits included are apples, pears, peaches and cherries.

"With the advent of quick freezing and specialties such as soups, potatoes, milk, spaghetti, pork and beans, and baby foods, there has been a tendency to keep the plants operating the year around. Recent years have seen dehydration, particularly on potatoes, soup stock, tomatoes, etc. Regardless of what is ultimately done with the fruit or vegetables, there is always wash water, blanching water, and wash down wastes to consider.

"While vegetable and fruit waste is not poisonous, it has an acid reaction and soon becomes putrescible. Peas and corn waste are objectionable to fish life because dissolved organic matter such as sugars, starches, etc., have high oxygen demand, and tomato waste is large because one-third of tomatoes leave the plant as waste.

"The lye peel method (caustic soda plus hot water) for loosening the skins of potatoes, beets, carrots, etc., has increased the solids as well as the B.O.D. of the wastes."

Treatment of canning wastes may include vibrating or rotary screens, removal of waste from pickling tables in plants in form of garbage to reduce the B.O.D. of liquid waste, lagoons after screening, with sodium nitrate as an aid in lagoons for keeping down odor and reducing B.O.D., flotation method for treating tomato waste, chemical treatment and contact or Dunbar filters followed by riffles.

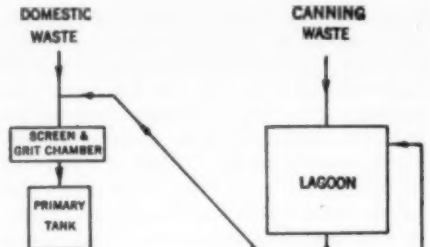
Odors are a problem but nothing compared to reduction of oxygen in streams with resultant fish kill. Excess dosage of lime is not desirable, due to effect on stream life and fish life. Not only are canning wastes seasonal and varied, but as Mr. Ryan states,[12] "Every canning plant is an individual problem and must be studied separately."

Wastes Cause a Variety of Problems

Not all of the problems of industrial waste treatment are those of stream pollution, and the problems of stream pollution can not always be solved by just dumping the waste in the sewers and sending it to the treatment works. There are problems that arise in the sewage treatment plant when industrial wastes are dumped.

Take, for example, the activated sludge sewage plant which received 5,000 gal. of soured milk early one morning, and another which periodically received slugs of oil when an oil refinery storage tank was allowed to overflow—the oil was skimmed off the tanks and returned.

Fibers from woolen underwear cause trouble in one plant, while peach seeds are a nuisance in another. Pumpkin seeds, chicken feathers, paunch manure, copper, synthetic rubber crumbles, hair, lime, and paper stock, all have at one time or another or continuously added to the woes and problems of sewage treatment plants, and one shouldn't forget the plant which for a week received 3 tons daily of perfectly good barley which malting firms can't "possibly lose to the sewer."



Flow Diagram of Canning Waste and Sewage Treatment Plant at Cokato, Minn.

(Courtesy W. E. King)

BY-PRODUCT RECOVERIES

Recovery of saleable by-products from industrial waste is not the simple answer to the economics of industrial waste treatment. Not every waste contains a recoverable material that has a potential market sufficient even to pay a part of the waste treatment and recovery costs.

On the other hand, some industries do waste or have wasted valuable recoverable products. For example, apple waste has possibility for recovery of by-products; pea vines and pods may be dehydrated and ground for feed admixtures, or fed as dry hay. Tomato seeds may be recovered and clean tomato and beet waste may be dried and used as an admixture in dog food. Recovery of other vegetable or fruit waste as saleable by-products generally has little to offer.

An outstanding example of recoverable wastes has been in the corn products industry, with the recovery of cattle food and other materials from starch waste. Still another example with a highly dramatic story is that of the distillery waste problem, about which Dr. C. S. Boruff[5] writes:

"In pre-prohibition and early post-repeal days, distillery residues were a waste disposal problem. This is no longer true; the problem is now one of recovery of valuable materials rather than disposal of a nuisance. Just prior to the war, recovery was at the rate of about 300,000 tons per year. Equipment now in the process of being installed will lead to a recovery of 1,000,000 tons a year. This million tons will have a normal peace time value of some $30,000,000.

"Some plants recover only the material retained on screens. Others recover whole stillage by screening and evaporating the screened stillage. Both these products are used in dairy cattle rations. In 1940, Hiram Walker introduced the practice of drying separately, on drum driers, a portion of the concentrated (clarified by centrifugation) thin stillage. This product, distillers' dried solubles, is finding ready acceptance in poultry and swine rations because it contains high quality protein plus significant quantities of the water soluble B vitamins, found to be necessary in poultry and swine nutrition."

In at least one instance it is the recovery of water itself which is the essential and controlling factor in the waste treatment. This situation exists at the famous Fontana (Cal.) steel plant of Henry J. Kaiser, where every drop of water is recovered for reuse. Saleable phenol recovered only partly pays for its own recovery, but the ex-

TABLE III

Types of Waste from The Pulp and Paper Industry

Type of Waste	Type of Treatment
Sulfite Waste Liquor	By Products Mfg. Vanillin Alcohol Yeast Others Lagooning Precipitation Processes Road Binder & Soil Stabilizer, etc.
Kraft Waste Liquor	Evaporation & Burning
Soda Waste Liquor	Evaporation & Burning
De-inking Waste	Precipitation, Filtration and Lagooning Sludge
White Waters	Precipitation, Flotation, Filtration, Centrifuging, Screening, Reuse of Fiber
Semi-chemical Waste Liquors	Barging Lagooning Recovery Processes in Development
Bleach Liquors	Precipitation Lagooning

treme shortage of available water makes complete treatment of waste and reuse necessary.

Air Pollution

At the present time, the sanitary engineering profession is more concerned with stream pollution than it is with air pollution, but sanitary engineers are not blind to the fact that air pollution is a problem in need of solution.

That atmospheric pollution abatement seems destined to lag somewhat may be attributed to several reasons; there are no sportsmens' leagues pressing for its accomplishment; there are no riparian laws regarding air; there are no major health problems of communicable disease involved (silicosis and lead poisoning are local and individual problems); there is no governmental program; and except for local areas the nuisance is minimum.

That is not to say that the local problems are not acute, but because of the fact that air pollution dissipates more quickly than stream pollution, and therefore does not often cross state boundaries or affect other communities, it has attracted less attention than stream pollution.

In brief, the attack on the problem must include smoke ordinances and inspection. The St. Louis experiment in the control of smoke is an outstanding example of what can be done, where a combination of smoke burners and elimination of soft coal was very effective.

Other methods of attack on the problem include Cottrell precipitators, washers, or cyclones for flue dusts, and ozone for odors. A more detailed discussion of these problems and their solution is a study in itself.

Local Industrial Waste Surveys

While governmental bureaus are generally staffed with personnel familiar with sanitary engineering problems, municipalities, particularly smaller ones, often face an industrial waste problem without an adequate idea of how to proceed.

How then should an industrial waste survey be conducted and toward what ends should it strive? In the first place the end in view must be abatement of pollution, not persecution of industry.

A good example of what not to do was done in Grafton, No. Dakota, where the waste from a potato dehydrating plant had been extremely detrimental to the operation of the local sewage plant. Lack of forehand knowledge of these effects had led to the difficulty, but cooperative study of the problem was not utilized as the solution. On the contrary, the municipality adopted a motion prohibiting the dumping of the waste into the sewer system until the company indemnified the city against damage and damage claims, etc. The company closed the plant and moved to another city.

There are numerous examples on the other side of the ledger where cooperative study of the problems involved has resulted in benefit to both parties.

If a municipality has industrial waste problems and desires to eliminate or alleviate them, the first step is to obtain adequate and informative publicity to the general public, stressing the fact that cooperation and aid to the industry is the paramount consideration.

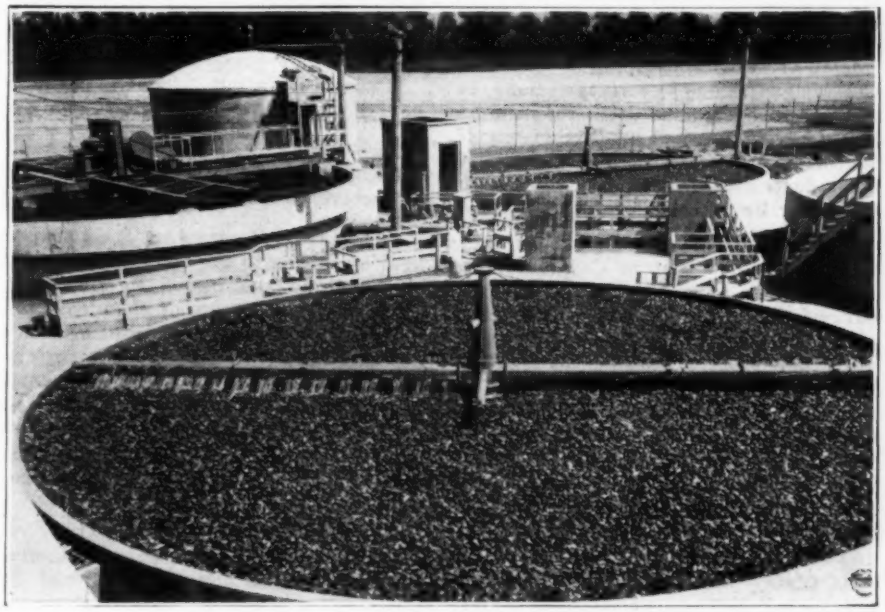
The second step is to list and classify all industries within the area to be covered by the survey. From these classes, (Breweries, Chemical products, Laundries, Dairy products, Tanneries, etc.) it is possible to divide the classes into two groups, according to the probability or knowledge of liquid wastes of other than sanitary nature. Industries not having liquid industrial wastes need not be investigated. Industries in the other group should be listed in order of their known relative importance and the survey is ready to begin.

The third step is to notify each industry to be investigated by a letter asking for a conference with the technical representatives of the municipal authority. First contact should be aimed at establishing friendly understanding of the problems involved and explaining the intent of the survey.

The fourth step is a plant survey or investigation of sewers and wastes; and, if indicated, sampling and analyses of wastes. In the latter case it is important to remember that sampling should be representative of plant operation and discharges.

Details of questions to be asked, information to be sought and analyses to be made depend largely on the local situation but a good guide to useful questionnaires may be found in the "Final Report to the Ohio River Committee—Supplement A, Collection of Data on Sources of Pollution."[14] Supplement B, "Organization and Methods of Laboratory Studies."[15] is likewise extremely helpful.

Thereafter, the survey consists of interpreting the data and information, in order that the cooperation of the industry may be obtained in reaching the desired end in view, whether it be elimination of the waste, partial pre-treatment of the wastes before discharge into the sewers, or payment by the industry of their fair share of the cost to the municipality for the treatment of the waste.



One of the Most Interesting Plants in America

(Kaiser Co.'s Fontana, Calif. Plant which provides complete treatment of all sewage and steel mill waste waters. These waters are recovered for reuse in plant operations. No wastes leave the plant! "It Can Be Done")

Payment for Treatment

In some cases it may be indicated that elimination of the waste is desirable and necessary, in others pretreatment before discharge into sewers, while in still other cases the simplest solution may be acceptance in the municipal sewers with treatment as a part of the city's sanitary waste. In the latter case it is entirely feasible that the industry pay its share of the cost of treatment.

The idea that industry pay the municipality for treating the industrial waste is not new. Neither is the idea that payment should be on the basis of service rendered or strength, quantity and amount of waste treated.

Fifteen years ago Frank A. Marston[16] stated, "Where the sewage is treated, the cost of operation and maintenance of the sewage treatment plant is influenced by the character of the sewage including industrial wastes, ground water and other leakage. Certain industrial wastes may add a considerable burden of expense because of their character; whereas relatively clean

rinse waters, although of similar volume, would not involve a corresponding cost. To meet these conditions, it is possible to set up the following: A schedule of charges based not only on the volume of domestic sewage or industrial wastes, but also on the degree of pollution as measured by relative amount of suspended matter, the biochemical oxygen demand, or some other factor."

In a report on Sewer Rentals in Ohio some years ago, F. H. Waring,[17] Chief Engineer, said, "In making up a sewer rental schedule, special allowances . . . should be made for certain unusual premises served, for example, — Industrial establishments where liquid wastes are admitted to the sewers. For the latter p r e m i s e s, variations in charges in accordance with the volume may be supplemented by further variation in accordance with the strength of the industrial sewage as compared with the domestic sewage."

One of the early municipal-industry agreements was that in Cedar Rapids, Iowa, where a packing company paid part of the cost of construction of the plant and pays a yearly sum toward operation costs. Other cities in the United States having some arrangements as to payment by industry for waste treatment in the past several years have been Sioux Falls, So. Dakota (packing plants); Boulder, Colo. (creameries and laundries); Traverse City, Mich. (grain elevator, creameries and certain other industries); Phoenix, Ariz. (dairy waste); Orville, Ohio (food process industries); Hillboro, Ore. (separate sewer and treatment and special charge for all industry); Freehold, N. J. (special rate for industrial waste delivered to treatment works in separate s e w e r). There are many others.

Most of these agreements have been on the basis of yearly charge or some other negotiated basis. In 1943-44 two municipalities assessed sewer service charges on the basis of volume of waste, and strength of constituents which contribute to the cost of sewage treatment. The first of these was Buffalo, N. Y., where this author and his associates developed a formula for charge in 1942 based on more than three years' study. The Buffalo service charge has been applied since February 1943.[18] The second city to make a similar basis of charge was New Brunswick, N. J.[19]

The Buffalo industrial sewer service charge as reported by Symons and Crane[18] in the March, 1944, issue of *Water Works and Sewerage*, was developed as applicable to all industries and is based on volume, and concentration of suspended solids *and chlorine demand*, as shown by the following formula:[18]

$$R = FP_c (C - N_c) + FP_s (S - N_s)$$

"Where R = rate of special charge in cents per 1,000 cu. ft. of volume of waste.

F = factor for converting parts per million to lbs. per 1,000 cu. ft.

P_c = contract price of chlorine in cents per lb.

C = concentration in parts per million, of chlorine demand of the waste.

N_c = normal dry weather chlorine demand of raw sewage in parts per million of sewage as received at the treatment works.

P_s = cost in cents for chemicals used in sludge conditioning and for power for disposal of solids resulting from one lb. of suspended solids received in the raw sewage at the sewage treatment works.

S = concentration, in parts per million, of suspended solids of the waste.

N_s = normal grit-free suspended solids in parts per million of raw sewage as received at the treatment works.

"The factor P_c may vary from year to year according to the contract price for chlorine and the factor P_s may vary according to the costs of chemicals and power involved in the disposal of solids as determined from operations for the previous year or previous two years. The factors C and S may be established by analyses (periodic or otherwise) to obtain average concentrations to be applied for any agreed length of period."

New Brunswick, N. J., decided on "treatment of all wastes at the municipal plant, without pretreatment by industry" and set up industrial waste charges by means of a city ordinance in Feb. 1944:

"The charges for factory effluents or industrial wastes discharged into the city sewers or tributaries thereof, shall be fixed and determined according to flow, suspended solids and chlorine demand, according to the following schedule of rates:

"$22 per million gallons.
"$5 per ton sludge solids.
"$5 per 100 lb. chlorine demand."

Experience at Buffalo a n d New Brunswick to date has been successful in the application of such charges. Industry has cheerfully paid the bill because this method places the technical burden of waste treatment on the municipal authority, and this burden industry fears more than the cost element.

Summary

In a broad review of a problem the size and complexity of that of industrial waste disposal, the discussion of details must perforce remain subordinated. Even so, the presentation may run to some length. It is well, therefore, to recapitulate certain salient points worth bearing in mind.

Not only may waste discharges involve economic loss to the industry in some cases, but damage to sewers and receiving bodies of water may constitute an economic loss of inadequate realization.

Pollution abatement programs will involve the expenditure of several hundred million dollars in the post-war period. These programs may be initiated generally by surveys conducted by governmental bureaus or political subdivisions thereof, but studies by trade associations will aid materially in these abatement programs. In fact, it is felt that the major strides which are to be made in industrial pollution abatement will come through the cooperative endeavors of industry.

Pollution abatement should be given first consideration on the basis of drainage basin, but municipalities may wish to undertake the solution of their own problems. In making an industrial waste survey, a municipality must consider that: (1)—each industry may have a variety of specific problems; (2)—cooperation with industry is essential; (3)—by-product recovery is not always the solution; (4)—final solution of the problem may involve complete elimination of the waste, pretreatment of the waste before discharge into the city sewers, or payment to the municipality for treatment by the municipality.

If industrial wastes are accepted in the sewers for treatment at the municipal plant, it is both fair and equitable that industry should pay its share of the cost of such treatment. Equitable means of charging industry has been developed on the basis of volume and concentration of constituents.

Industrial Waste Disposal is the problem of Today. Its solution should be a definite part of the planning for Tomorrow.

References

1. Alex C. Burr, Paper before Water, Sewage and Sanitation Division of the Amer. Chem. Soc. at the 109th Meeting, New York City, Sept. 8-12, 1944.
2. Alex C. Burr, private communication.
3. Wil'iam S. Wise, Paper before Water, Sewage and San. Div., A.C.S., at 109th Meeting, New York City, Sept. 8-12, 1944.
4. E. F. E'dridge, Mech. Eng., Exp. Sta. Bull. No. 14.
5. C. S. Boruff, private communication.
6. Harry Gehm, private communication.
7. Richard D. Hoak, private communication.
8. Maurice Le Bosquet, Jr., private communication.
9. M. M. Ellis, *Water Works & Sewerage*, Vol. 91, p. 171 (1945).
10. House Document No. 155, 76th Congress, 1st Session.
11. House Document No. 266, 78th Congress, 1st Session.
12. Public Health Reports, USPHS, Vol. 59, No. 27, July 7, 1944.
13. Wm. A. Ryan, private communication.
14. Fed. Sec. Agency, USPHS—Ohio River Pollution Survey, Final Report, Supplement A, 1942.
15. Fed. Sec. Agency, USPHS—Ohio River Pollution Survey, Final Report, Supplement B, 1942.
16. Frank A. Marston, Proc. Am. Soc. Mun. Improvement, p. 377, 1929.
17. F. H. Waring, "Sewer Rental in Ohio" (Ohio Dept. of Health).
18. Geo. E. Symons and F. W. Crane, *Water Works & Sewerage*, Vol. 91, p. 144 (1944).
19. Chester W. Paulus, *Sew. Wks. J.*, Vol. 16, p. 678 (1944).

WATER AND SEWAGE PATENTS

(OF RECENT ISSUE)

WATER PATENTS

Manufacture of Bell-End Pipe. Ralph L. Barbehenn (to Johns-Manville Corp., New York); U. S. 2,383,582; Aug. 28, 1945; (Appl. 12-22-43). Method of manufacturing a bell-end pipe of hardened compressed fiber-cement composition.

Centrifugal Pump. James G. Read, New Smyrna Beach, Fla.; U. S. 2,385,730; Sept. 25, 1945; (Appl. 8-13-43).

Method of and Apparatus for Tensioning Wire in Banding Operations. John M. Crom, Washington, D. C.; U. S. 2,385,796; Oct. 2, 1945; (Appl. 3-20-44). Method and equipment for prestressing concrete tanks.

Water Softening and Washing Product and Method of Preparing Same. Leonard Meites, Chicago, Ill.; U. S. 2,385,928; Oct. 2, 1945; (Appl. 3-13-42). Method of preparing a water soluble product from a mixture of crystalline trisodium phosphate and phosphorus pentoxide. U. S. 2,385,929. Preparation of water soluble compound from trisodium phosphate and monosodium dihydrogen phosphate.

Floating Roof for Liquid Storage Tanks. John H. Wiggins, Chicago, Ill.; U. S. 2,386,022; Oct. 2, 1945; (Appl. 1-27-44). Cover consists of an annular and a central pontoon with attached roof sloping toward the center.

Streamcurrent Apparatus for Handling Solutions and Suspensions. George A. Auer; U. S. 2,386,419; Oct. 9, 1945; (Appl. 8-12-43). A conically shaped tank (inverted) with partition disposed within, having the same slope as the tank walls, and a centrally disposed tube for discharge of liquids into the tank and a discharge connected at the bottom to the annular space within the cone.

Self-priming Centrifugal Pump. Charles I. Longenecker (To Chain Belt Co., Milwaukee, Wis.); U. S. 2,386,485; Oct. 9, 1945; (Appl. 5-17-43). An intake unit for a recirculating self-priming centrifugal pump, with other features of construction of the pump.

Underdrain for Filters and the Like. James D. Walker (to Amer. Well Works, Aurora, Ill.); U. S. 2,387,101. (See same title under Sewage Patents which follow.)

Well Screen. Virgil F. Every, Rochelle Park, N. J.; U. S. 2,387,725; Oct. 30, 1945; (Appl. 1-28-44).

Pumping System. Glenn A. Patterson (to Red Jacket Mfg. Co., Davenport, Iowa); U. S. 2,387,941; Oct. 30, 1945; (Appl. 4-10-43). Combination water system comprising pressure storage tank, pump, conduit, air chamber, snifter valve, check valve and bleeder.

These patent abstracts being brief do not necessarily cover the entire scope of the invention described. If the reader becomes especially interested in any of these patents he should obtain printed copies of the complete patent, at 10 cents each, from the Commissioner of Patents, Washington 25, D. C.

Deaerating Feed-Water Heater. Joseph F. Sebald (to Worthington Pump and Machinery Corp., Harrison, N. J.); U. S. 2,388,344; Nov. 6, 1945; (Appl. 10-3-44).

Fluid Proportioning System. Thomas A. Baker, Logansport, Ind.; U. S. 2,388,669; Nov. 13, 1945; (Appl. 12-24-42). A fluid control device including an air passage and a liquid passage jointly feeding a common chamber, with variable means for regulating flows.

Flow Responsive Switch. Nathaniel Brewer (to Fischer and Porter Co., Hatboro, Pa.); U. S. 2,388,671; Nov. 13, 1945; (Appl. 5-26-43). A device for signalling insufficient rate of flow.

Flow Measuring Device. Nathaniel Brewer (to Fischer and Porter Co., Hatboro, Pa.); U. S. 2,388,672; Nov. 13, 1945; (Appl. 8-13-43). For measuring the rate of flow of fluids, a vertically extended metering tube with a metering float of conically flow-constricting head.

Diaphragm Valve. Charles Mueser (to T. Shriver & Co., Inc., Harrison, N. J.); U. S. 2,388,988; Nov. 13, 1945; (Appl. 4-7-44). Also U. S. 2,388,989); Nov. 13, 1945; (Appl. 4-8-44).

Means for Sealing Rotary Plug Type Valves. William A. Fennel, Clairton, Pa.; U. S. 2,389,036; (Appl. 3-23-43).

Fluid Meter. Raymond H. Barge (to Pittsburgh Equitable Meter Co., Pittsburgh, Pa.); U. S. 2,389,125; Nov. 20, 1945; (Appl. 8-28-42). A meter of the oscillating piston type.

Apparatus for the Purification of Water. Herbert L. Dick (to Tested Appliance Co., Chicago, Ill.); U. S. 2,389,185; Nov. 20, 1945; (Appl. 2-12-43). A filter paper filter for attachment to a faucet.

Filter Bed Cleaning. Philip B. Streander, Maplewood, N. J.; U. S. 2,389,329; Nov. 20, 1945; (Appl. 2-14-41). A travelling cleaning device adapted to move along a filter bed, said device comprising an open-bottom caisson movable over the surface of the bed, with a hollow transverse cleaner head beneath the caisson so positioned that it is at the bottom of the filter bed, with a continuous leading face extending the length of the caisson with means to supply water pressure to the head through orifices at its face, thereby loosening the sand as the head moves forward. Dirty water is removed through the caisson.

Antibackflow and Antisiphonage Valve. Frank Carlton, Los Angeles, Calif.; U. S. 2,389,412; Nov. 20, 1945; (Appl. 9-26-41). An antibackflow device to be interposed between an induction line and an eduction line, within both of which variable fluid pressure prevails.

Method of Preventing Backflow or Back-Siphonage in Pressure Systems. Frank Carlton, Los Angeles, Calif.; U. S. 2,389,413; Nov. 20, 1945; (Appl. 1-17-44). Method and device for preventing backflow in a water distribution system.

Chlorinating Apparatus. Walter Lowenstern (to Houston Oxygen Co., Houston, Tex.); U. S. 2,389,524; Nov. 20, 1945; (Appl. 2-2-44). A vertical

cylinder device with rotating paddles therein and means for introducing chlorine into the water in the cylinder in tangential direction to flow of water also being introduced at the bottom.

SEWAGE PATENTS

Grease Trap. Charles Arndt, So. Pasadena, Calif.; U. S. 2,383,436; Aug. 28, 1945; (Appl. 8-20-42).

Sewage Ejector. Charles Yeomans (to Yeomans Bros. Co., Chicago, Ill.); U. S. 2,383,834; Aug. 28, 1945; (Appl. 11-5-43). Sewage handling apparatus comprising a receiver with inlet and outlet sewage piping and means for delivering steam pressure to receiver to eject sewage or sludge therefrom.

Water Treatment. Samuel A. Winkelmann (to The Texas Co., New York); U. S. 2,385,903; Oct. 2, 1945; (Appl. 7-1-42). Process of purifying waste water containing sodium chloride, calcium carbonate, calcium bicarbonate, iron salts, and bacteria, which comprises subjecting the waste water to electrolysis to render the water alkaline and form sodium hypochlorite, whereby the bicarbonates are converted to carbonates and the iron salts to hydroxides and the bacteria are killed. Finely divided solid calcium carbonate is added to the water and mixed to aid settling and deposition of insoluble materials, and the water is further treated with a calcium sequestering agent.

Air Compressor and Apparatus Operated Thereby. Charles Yeomans (to Yeomans Bros. Co., Chicago, Ill.); U. S. 2,385,905; Oct. 2, 1945; (Appl. 1-20-44). A pneumatic ejecting system (for sewage, sludge, and the like) with a receiver for fluid materials, a vent for relieving air, a pneumatic valve for operating vent, and an air compressor for delivering compressed air to the receiver, thereby expelling the contents therefrom.

Underdrain for Filters and the Like. James D. Walker (to The American Well Works, Aurora, Ill.); U. S. 2,387,101; Oct. 16, 1945; (Appl. 3-20-42). An underdrain for filters and the like including a central member with wings disposed transversely and downward and spaced, along with lugs on the central number so as to be appropriate for supporting filter media, and allowing for free drainage through the underdrain.

Sewage Disposal. John A. Montgomery and Louis E. Livingston (to Lakeside Engineering Corp., Chicago, Ill.); U. S. 2,388,795; Nov. 13, 1945; (Appl. 6-11-42). Method for sewage treatment wherein raw liquid is subjected to clarification and purification for removing heavy matter and settleable solids, followed by flowing the clarified liquid downward through an aeration chamber consisting of a submerged filter bed through which air is passed upward. The liquid then flows upward through a contiguous settling basin in which is provided a quiescent zone for settling solids from the upward moving liquid which is removed over a weir at the surface.

Sampling Device. Edmond T. Roetman (to American Viscose Corp., Wilmington, Del.); U. S. 2,388,801; Nov. 13, 1945; (Appl. 4-1-42). An apparatus for sampling liquid flowing in a channel, comprising a channel, measuring device, means for maintaining the level of liquid at a proportional height to the rate of flow, a rotatable shaft at right angles to line of flow, and a scoop with open face rotating in the direction of flow, with discharge of scoop to adjacent receptacle. The volume of liquid collected as a sample portion is proportional to the depth of flow which in turn is proportional to the volume of flow.

Sewage Sludge, Screenings, and Garbage Combustion Apparatus. Adolphe C. Peterson, Minneapolis, and Clifford R. Raiter, St. Paul, Minn.; U. S. 2,389,077; Nov. 13, 1945; (Appl. 2-19-41). An apparatus for combustion of sewage sludge or other moisture containing matter comprising an elongated horizontal casing, in which an endless conveyor moves to carry sludge from feeding end to combustion chamber at other end, wherein a steam generating unit is housed.

Sewage Comminutor. Walter H. Green (to Infilco, Inc., Chicago, Ill.); U. S. 2,389,306; Nov. 20, 1945; (Appl. 10-4-43). A sewage solids cutting and straining device comprising a semi-cylindrical grid adapted to be interposed across a flowing stream of sewage, a plurality of horizontal slots extending circumferentially of said grid, a plurality of rotatable discs extending through said slots to the upstream side of the grid, and a prime mover connected to the discs.

System of Sewage Clarification and Sludge Removal. Llewellyn B. Griffith, Austin, Tex.; U. S. 2,389,357; Nov. 20, 1945; (Appl. 1-15-42). A channel with submerged transverse weir plates, separating the channel into a plurality of tanks, with an under flow baffle plate in each tank, and partitions in each tank and means for discharging air into each tank near the surface of the liquid in a manner to cause the liquid to move to the next tank.

Solution to Filter Cloth Blinding Problem

T. R. Banks, manager of the Soap and Extraction Div. of Hershey Estates, Hershey, Pa., seeing that the readers of *Water Works and Sewerage* apparently have considerable difficulty with the blinding of the cloths used in dewatering lime-conditioned sludges on vacuum filters, offers his experiences with non-fibrous Vinyon Cloth in place of the fibrous cotton or woolen cloths.

Mr. Banks has the following to say—

"On page 309 in your October issue one operator complains of filter cloths in sludge dewatering being blinded with carbonate of lime after three or four hours' operation. We had this same problem on a filtering job. In order to overcome this blinding, we changed from cotton cloth to Vinyon Cloth, produced by Wellington Sears Co. of New York.

"Vinyon, as you know, is a synthetic fibre which is composed of solid rod-like fibres instead of hollow tubes such as cotton and other natural fibres. We found that the cotton fibres allowed calcium carbonate to crystallize inside the tube, therefore blinding the mesh.

"After substituting Vinyon Cloth, we get six, eight and 10 *weeks*' filtration without blinding. Now when we have blinding we just pour a little Hydrochloric Acid into the tank of the rotary filter and give the cloth a short period of washing. It is then as good as new. This cloth is both alkaline and acid-proof but will *not* stand temperatures over 150 degrees Fahrenheit.

"I am sending you this experience with the hope that it may help this fellow because it meant so much to us to get good filter operation."

Thanks a lot, Mr. Banks, for your kind consideration of your fellow operators. We are always happy to receive such helpful operating advice as your letter represents.—L. H. E.

Maurice Coblentz Now in San Francisco

Maj. Maurice H. Coblentz, USPHS (R), former sanitary engineer with the Maryland State Dept. of Health, is now with District No. 5, in San Francisco, in connection with the Surplus Property Utilization program.

Since leaving Maryland in May, 1942, Maj. Coblentz has had a varied experience, first with the District Engineers Office of Mobile, Ala., then transferred to R. & U., U. S. Engineers, Atlanta, Ga. Thereafter, he was commissioned Major USPHS as Water Security Officer, 4th Corps Area, Atlanta.

OHIO SECTION'S DIVISIONAL MEETINGS*

THE State of Ohio has 546 cities and villages with public Water Systems but the Ohio Section through its membership had been able to reach only approximately 10 per cent of these systems. For this reason it was felt advisable to attempt to reach more men by means of divisional meetings and it was hoped that many operators of small plants employing three men or less would be able to attend a meeting located near home. Travel and hotel difficulties added to the decision of the Ohio Section to try a series of four meetings.

One-day meetings were scheduled in a central point of each of the four quarters of the State: Findlay, Wilmington, Athens, and Massillon. A total registration of 186 was obtained for the four meetings, broken down as follows:

Findlay	60
Wilmington	34
Athens	17
Massillon	75

With a membership of only 7 in southeast Ohio, the registration of 17 at Athens was most encouraging.

All meetings followed a similar pattern with prepared papers on three subjects, and ample time for discussion and the raising of questions by the registrants.

Water Treatment and the Public Health Viewpoint

"Some Aspects of Water Treatment From the Public Health Viewpoint" was the title of the first paper, given by Earle S. Hoyt, Asst., and Mr. F. H. Waring, Chief Engineer, Ohio State Department of Health. The exodus of the personnel from the central office to the Sanitary Corps of the U. S. Army necessitated the placing in effect of a plan utilizing 10 District Engineers. The Director of Health insisted on compliance with the State Law pertaining to annual inspection of all water treatment plants. Regional Engineers performed this service.

"Defense in depth" was urged for all water works. Reliance should not be made on one process for water treatment but upon two or three processes which could not be disrupted by the failure of any one process. Stand-by chlorinators were urged for all plants as a part of the "defense in depth."

Maintenance Problems

Mr. A. A. Ulrich, Vice Pres. of the Ohio Water Service Co. and Manager of the Massillon Water Works, presented a paper on "Maintenance Problems" which dealt with unusual conditions encountered in Massillon. A 3 mgd. well that had fallen off to 1.4 mgd. was rehabilitated to 2.1 mgd. (after failure of response to acid and dry ice treatment) by pulling the well and replacing the screen. Motor failure on the largest high service pump was solved by placing a stand-by pump and well in service until a rental motor could be obtained. The original motor was rewound. The enlargement of the ⅛-in. holes in the perforated piping of the recarbonating basin through which the CO_2 gas was discharged was solved by the use of tile joining same with hydro-tite, and enlarging the cooling and settling chambers. It was decided that either the clogging or enlargement of the openings in the pipes of the recarbonation chambers was caused by improper cooling and settling of the gases prior to introduction into the system of piping. Where proper procedure was used, no problem was encountered either in failure of material or clogging or enlarging of pipe openings.

Discussion of maintenance of distribution systems brought forth the method used by the City of Akron in the replacing of a cracked 36-in. Class A cast iron pipe installed 16 ft. beneath the surface of the ground. In making this repair use was made of an electric welder for cutting the pipes. The section of pipe to be inserted was first cut on the top of the ground. One circumferential cut was made separating the section to be replaced, and this section of pipe was cut longitudinally along the top. Wedges driven into the cut split the pipe into two sections which were easily lifted out. The total time consumed in removing and replacing of pipe was about three hours. Fifty pounds of welding rod costing approximately $15.00 were used.

How to Get Along with Elected Officials

Ira M. Hoover, Superintendent of Montpelier Water Works, dealt with the problem, "How Can I Get Along With the Elected Officials of My Village?" Mr. Hoover advocated that the operator should know each official with special attention paid to the members of the Board of Public Affairs, his business, how he conducts his business, his education, his likes and dislikes, and about all his weaknesses, so that the proper method of approach may be made in operating the utility. He advocated a soaking-in period prior to asking for a decision on a subject that is unfamiliar. The support of the State Department of Health with communications directed to the officials is also helpful in obtaining a proper response. The keeping of needs and suggestions for plant improvements and maintenance before the Board at all times makes the routine complaint look small in comparison. This decreases the operating difficulties of the Manager.

Discussions revealed that little or no difficulty was being encountered in the collection of water bills. One small utility having no delinquencies had lost no money through uncollectable accounts during its life of operation which is approximately 15 years.

Public Relations and AWWA

Mr. W. R. LaDue, Vice President of the AWWA and the official representative at this series of meetings, spoke of the formation of a new Public Relations Committee whose duties include the preparation of material for use by those employed in the water works field in their endeavor to gain proper recognition for the utility and for themselves. This public relations effort is a result of communications pointing out the fact that low salaries in the water works field undoubtedly have a direct relationship to the non-appreciation by the general public of the responsibilities and importance of the utility and its employees in furnishing an adequate amount of wholesome water at all times.

At the Massillon meeting, Harry Jordan, AWWA Secretary, talked on the activities of the Association. Emphasis was placed on postwar planning and construction, there now being a dirth of water works improvements ready for contract. This condition involved many causes, among them being the unanticipated quick close of the war, the lack of a definite policy of participation in costs by the Federal Government, the lack of engineers and technicians, the lack of financing arrangements by political subdivisions for plan preparation and project construction, and the extremely high prices submitted by contractors caused in part by the unstability of labor conditions.

The registration was distributed between Water Superintendents, Consulting Engineers or Employees (83 per cent), and manufacturers' representatives (17 per cent).

The feeling prevailed that an increased attendance could be anticipated at future meetings of a similar character and it is believed that meetings of this nature have a place in section activities.

*A report based on information supplied by L. J. Hoffman, Sec'y Ohio Section.

The Editor's Comments

Ohio River Report Points the Way

Perhaps because of its size (three volumes containing 1500 pages and weighing six pounds), the final report on the Ohio River Pollution Survey has not received a great amount of discussion in the technical press. But any pollution survey which required three years to complete and cost $600,000 should be of considerable interest now that the war is over and municipalities and industry can take up the attack on pollution abatement with the determination deserved by this matter of reclaiming our badly overloaded streams.

This report covers a river drainage area of 204,000 square miles, having a population of 19,000,000, and includes a study of 3,700 municipalities and 1,800 industries. In the study, 71,000 samples were collected from 2,000 sampling points and 131,000 analytical determinations were made. Certainly any study and report as large and complete as this one on pollution control of such a major water-course as the Ohio River and its tributaries should serve as a guide to any individual, municipality, political entity, or industry faced with a stream pollution abatement problem. Of particular interest are the "Waste Guides," published separately as Supplement D, obtainable for 30 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

While the complete report may be unwieldy, it is possible to obtain a summary of some 17 pages which has been prepared by M. Le Bosquet, Jr., Sanitary Engineer, USPHS. This valuable summary in the form of a paper has been presented by Mr. Le Bosquet before the delegates of the Ohio River Valley Sanitation Compact, and copies are available.

Briefly, in addition to several maps showing the location and extent of various types of pollution in the Ohio River Basin, the report contains tables showing the status of municipal sewage treatment, a summary of industrial wastes, and a map revealing proposed impounding reservoirs on the watershed for flood and pollution control through regulation to provide increased dilution during periods of natural flow deficiency.

The report discusses such matters as the activities involved in a pollution survey, sources of pollution, acid mine drainage, metropolitan area pollution, low flow regulation, and the various costs of pollution abatement, including capital costs.

It is worth reiterating, that any study which has delved into existing pollution of streams and comes out with a proposal for the expenditure of some $254,990,000 for pollution abatement is worth knowing about by persons or organizations interested in pollution abatement, whether or *not* such persons or organizations are located in the Ohio River Basin.

There is one conclusion in the Ohio River Pollution Report that bears repeating. The report "recommends that the proposed Ohio River Valley Sanitation Compact take control of all existing and future sources of pollution . . . affecting the normal use of water in another state," and that this Compact become a permanent organization. To date all states concerned have approved the Compact with the exception of Virginia, which is expected to approve it early in 1946. Here is a pollution abatement problem for which much of the "blueprinting" has been done. The Ohio River Report points the way and constitutes a worthy guide! [G.E.S.]

Unfair Burden

The foregoing commentary on the most painstaking, exhaustive, and expensive stream pollution survey ever to be made was written for placement elsewhere in this issue, but it is believed that it deserves the position given it on this page.

The Ohio River Pollution Survey of the U. S. Public Health Service, and its report thereon, brings to mind some recent observations covering problems in water treatment on the Ohio and some of its more polluted tributaries. Industrial pollution has grown to proportions on this watershed such as to create a critical problem for a number of water utilities. To remove certain odors costly high-pressure aeration and/or super-super chlorination, in conjunction with aeration and extra heavy dosages of activated carbon and dechlorination with sulfur dioxide, has been required. Needless to add, the cost of producing a drinkable water (not necessarily a palatable water at all times) has gone up to previously unheard of figures in these unfortunate places.

In one instance, the water purification plant superintendent comes out publicly with the view that what seems indicated in such instances as now confront him —and others—on the Ohio river is a treatment consisting of two distinctive stages, rather than a single stage. The first stage would consist of a biological treatment which would be a modification of the well established diffused air activated sludge process which is capable of removing a heterogeny of organic constituents. The orthodox water purification plant should then be found capable of producing a satisfactory finished water by taking up where the sewage treatment phase leaves off. In other words, the community's water supply would first be processed as a combination of diluted sewage and industrial wastes, which it unfortunately is in many instances, and the bio-purification plant effluent will constitute the "raw-water" for the orthodox filtration plant.

Perhaps A. R. Todd, Superintendent of Filtration at Wheeling, W. Va., where super-chlorination to the extent of 30 ppm. chlorine and subsequent dechlorination and heavy applications of activated carbon have been required in the production of a drinkable water, is correct in his thoughts that the combination of sewage and water treatment processes will prove overall more economical and a more dependable method of insuring a palatable product, under greater variations of industrial and sewage loadings on the stream, than has been possible with known methods of water treatment.

In other places, notably Philadelphia at present, we find proposals being made to leave the nearby river supply of many years use and go miles away to the mountains for palatable, cleaner water at millions of dollars of cost to the people of Philadelphia. Why, ask we, should the Wheelings of America be required to go to extraordinary measures and expense of production of water just in order that industrial pollution may go on apace? On the same grounds, why should low-cost nearby stream supplies, satisfactory in earlier years, have to be abandoned for a high-cost distant supply? Polluters have no right to use waterways in a manner which throws such unfair burdens on downstream taxpayers and the water supply industry.

L. H. Enslow

ENGINEERS REPEATEDLY SPECIFY

COMMINUTORS
FLUSH-KLEENS
SCRU-PELLERS

FOR AUTOMATIC, TROUBLE-FREE HANDLING OF SEWAGE . . . . . ELIMINATING MOST COMMON AND USUAL TROUBLES IN SEWAGE PLANTS AND LIFT STATIONS

COMMINUTORS provide subsurface automatic screening and cutting of sewage solids without removal from channel.

No screenings odor or fly nuisance.

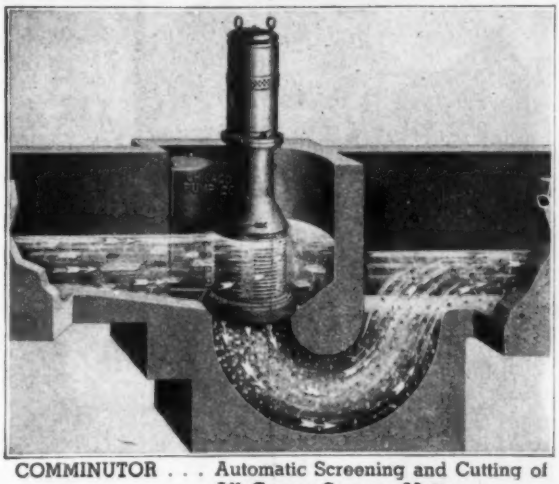
No collection and disposal of screenings.

No clogging of mechanical equipment by sewage solids.

Reduce scum formation and floating solids.

1200 INSTALLED

Ask for Bulletin 185



COMMINUTOR . . . Automatic Screening and Cutting of All Coarse Sewage Matter.

FLUSH-KLEEN raw sewage pumps can't clog. Solids do not pass through the impellers. Operation is automatic.

FILLING WET WELL

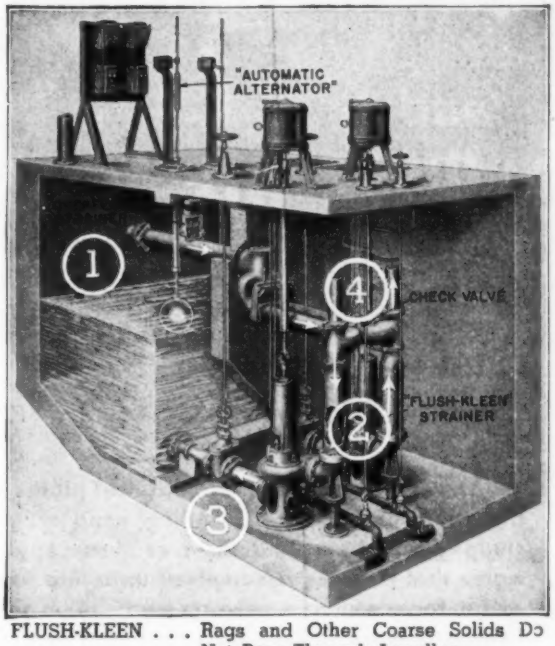
1. Sewage flows through inlet pipe.
2. Sewage solids are retained by strainer.
3. Strained sewage flows through idle pump to basin.

PUMPING

3. Strained sewage is pumped from basin.
2. Sewage solids are backwashed from strainer.
4. Special check valve closes; sewage and solids are pumped to sewers.

3000 INSTALLED

Ask for Bulletin 122



FLUSH-KLEEN . . . Rags and Other Coarse Solids Do Not Pass Through Impeller.

SCRU-PELLER was designed especially for pumping primary sludge. Also effective in handling raw sewage.

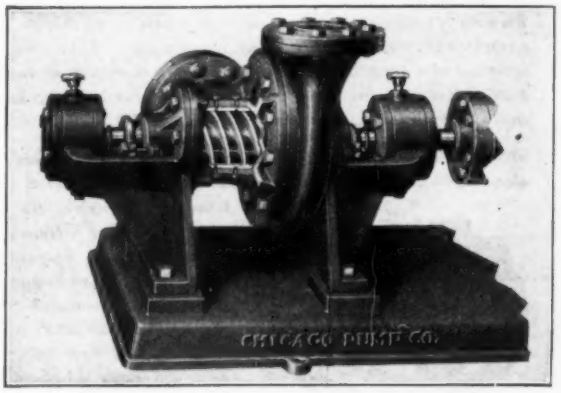
It is a centrifugal pump with a cutting screw feed in the suction. Cutting edges on the screw and in its housing shear solids that clog ordinary pumps.

The only pump providing continuous multiple shearing actions all the way through the pump.

The only cutting pump with ball bearings on both sides of the impeller and built STURDY enough for severe shocks.

1000 INSTALLED

Ask for Bulletin 190



SCRU-PELLER . Centrifugal Pump With Cutting Screw Feed.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2349 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Flush-Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

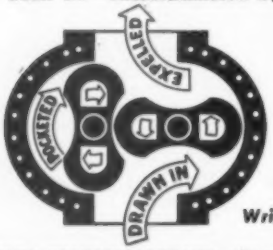
Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

This battery of five (5) POTTSTOWN Blowers has been doing a continuous 24-hour-daily job for over 10 years—and this plant has *NEVER for a single moment* been without its required volume of air.

The engineers of sewage disposal plants know the value of air—the unending need of air for sludge activation. And most of these engineers agree that their requirements of *unfailing* supplies of air for continuous sewage purification are delivered *best* by POTTSTOWN Rotary Blowers.

Efficient positive displacement with these POTTSTOWN Rotary Blowers is accomplished because their precision machining permits exceptionally close clearances on moving parts. Their efficiency is maintained during long life because there is no actual contact or friction between the impellers themselves—nor between impellers and casing interior. *No wearing parts here!*

With friction eliminated, interior lubrication is unnecessary. Only clean air—uncontaminated by lubrication—is delivered to your filters or diffusers. No valves, springs, or other friction parts to wear out or to necessitate repairs. Simplicity of design, sturdy construction, precision machining—THESE FEATURES eliminate maintenance and adjustments, even on *daily 24-hour service!*



Write today for our new Bulletin P-100.

ALLEN BILLMYRE COMPANY, 449 Fayette Avenue, Mamaroneck, N. Y.

POTTSTOWN
ROTARY POSITIVE DISPLACEMENT
BLOWERS

MEETINGS SCHEDULED:

Jan. 10-11, 1946—LAFAYETTE, IND. (Purdue University) **Industrial Waste Conference.** Chairman, Don. E. Bloodgood, Assoc. Prof. of San. Engr'g., Purdue University, Lafayette, Ind.

Jan. 15—NEW YORK CITY, N. Y. (Hotel Pennsylvania) **New York Section A.W.W.A.** (Host Luncheon Meeting) 12:30 P.M. Sec'y-Treas., R. K. Blanchard, 50 West 50th Street, New York 20, N. Y.

Jan. 16-18—NEW YORK CITY, N. Y. (Commodore Hotel) **American Society of Civil Engineers.** (Annual Meeting) Sec'y, Col. Wm. N. Carey, 33 West 39th Street, New York, N. Y.

Jan. 18—NEW YORK CITY, N. Y. (Hotel Pennsylvania) **New York State Sewage Works Association.** Sec'y-Treas., A. S. Bedell, State Department of Health, Albany, N. Y.

Mar. 14-15—MINNEAPOLIS, MINN. (Hotel Radisson) **Minnesota Section A.W.W.A.** Sec'y-Treas., R. M. Finch, 416 Flour Exchange Building, Minneapolis, Minn.

Mar. 28-29—ELMIRA, N. Y. (Mark Twain Hotel) **New York Section A.W.W.A.** Sec'y-Treas., R. K. Blanchard, 50 West 50th Street, New York 20, N. Y.

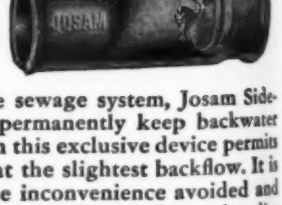
May 6-10—ST. LOUIS, MO. (Exhibits & Technical Meetings in Auditorium) (Accommodations in 12 Hotels) **American Water Works Conference.** (Annual Meeting). Executive Secretary, Harry E. Jordan, 500 Fifth Ave., New York 18, N. Y.

WEATHER FORECAST:
Rain — Sleet — Snow!

STOP BACKWATER FROM SEWERS . . . this easy way

Heavy rain, sleet and snow in the coming months will overtax your sewer systems sending floods of backwater and sewage into the basements of many homes in your community.

JOSAM SIDE-SWING BACKWATER SEWER VALVES
Eliminate This Danger!



Installed at proper points in the sewage system, Josam Side-Swing Backwater Sewer Valves permanently keep backwater out of basements. The flap valve in this exclusive device permits speedy drainage yet closes tight at the slightest backflow. It is so inexpensive compared with the inconvenience avoided and damage prevented to property, equipment and merchandise that it should be installed at once! For further information write for free folder on Backwater Control.

JOSAM MANUFACTURING COMPANY
320 EMPIRE BUILDING • • • CLEVELAND 14, OHIO

JOSAM-PACIFIC CO., San Francisco, Calif. *West Coast Distributors*
EMPIRE BRASS CO., Ltd., London, Ont. *Canadian Distributors*

THERE ARE NO SUBSTITUTES FOR JOSAM PRODUCTS

Precision Threads Quickly Easily

with self-contained semi-automatic

RIGID No. 65R

• Save yourself time and effort in threading 1", 1¼", 1½" and 2" pipe. This rugged steel-and-malleable 65R gives you precision threads faster and with less effort than you've thought possible. You like the 10 second setting to size with one set of chasers that stay in the die stock (no extra dies to bother with) and the instant-setting foolproof workholder. Precision cut high-speed steel chasers and factory testing of every threader assure you of clean perfect threads, smooth faultless operation. For quicker easier threading buy the 65R at your Supply House.

RIGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

HERE'S THE FLOW RATE CHART THAT'S REALLY *Easy to read*

GET THE WHOLE STORY AT A GLANCE!

Why worry with factors and "microscopic" low rate readings when all Simplex MS meters use an evenly spaced chart—with even graduations from 0 to maximum.

WHAT DOES THIS MEAN TO YOU?

1—The direct reading chart with 0 factor only assures the same high accuracy and ease of reading anywhere in the flow range from minimum to maximum flow.

2—Even graduations make it easy to read low as well as high flows from a distance.

3—Greater accuracy of chart readings from planimeter.

4—Extreme accuracy of chart record is inevitable since pen arm connects directly with bell-shaped float.

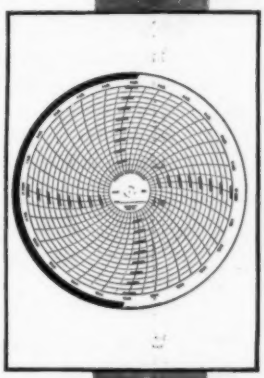
5—Special moisture proof paper eliminates stretching and shrinkage—chart cannot slip in use.

Simplex has "engineered" the chart on the MS meter as well as every mechanical detail. This direct reading chart is made possible because of the unique bell-shaped float which extracts the square root of the law of flow. Here is accuracy, ease of recording, and ease of reading—yours for the using in every Simplex Type MS meter. There is no finer meter at the price. Specify Simplex MS meters. Write for details today.

SIMPLEX VALVE & METER CO.

6743 UPLAND STREET, PHILA, PA.

MS meters can be set up as indicator; recorder; indicator and recorder; indicator and totalizor; recorder and totalizor; or indicator, recorder, or totalizor.



12" circular chart for daily or weekly removal. Electric or mechanical clock drive.

SIMPLEX METERS

THE METER WITH THE BELL SHAPED FLOAT

If You Could See the Bottom of YOUR Storage Reservoir . . .

Would it look like this?

Sand deposited since 1912, storage reservoir Station "O", at Portland Gen'l Elec. Co. 22,000-kilowatt plant, Roslyn Lake, Bull Run, Oregon.

The *Captain George* on Roslyn Lake

● Roslyn Lake, a hydroelectric power plant reservoir one-half mile wide and three-fourths mile long, with an original depth of water varying up to 40 feet, gradually accumulated a sand deposit approximating 1,000,000 cubic yards. This reduced the effective water storage by half.

Today, this sand is being removed at the rate of 160 yards per hour, with consumed energy at 1.6 kw-hr per yard. Sand disposal is beyond a 25-foot dike, 4000 feet distant from the farthest dredging point.

This job is being done by the *Captain George* Dredge, equipped with a Morris 12" Heavy Duty Dredge Pump.

● Morris Dredges, designed for reservoir cleaning, filling low lands, draining low areas, park beautification and general municipal projects, deliver MAXIMUM OUTPUT by impelling the maximum amount of solids through the pump at a uniform rate; and give MAXIMUM LENGTH of SERVICE through rugged construction, accurate machining and interchangeable parts.

FOURTH JOB FOR CAPTAIN GEORGE IN DIFFERENT PARTS OF COUNTRY

1. (Near Chicago) Production of heavy sand and gravel, delivering through 1500' of 12" discharge line against 30' static head.

2. (Mississippi River) Dredging for locks and dams.

3. (Alberta Lea, Minn.) A lake improvement project, moving 500,000 cu. yds. of mud, clay, sand and gravel through 12" discharge lines up to 3500' in length.

4. On present Roslyn Lake dredging project.

Write for Bulletin 177 . . .

MORRIS MACHINE WORKS Baldwinsville, N. Y.
Branch Offices in Principal Cities

MORRIS CENTRIFUGAL PUMPS

Here and There with Doc Symons

Thought you'd like to know who won the "Here & There" cup for the best improvement in a golf score during the 1945 season.

Remember, at the start of the season, Smoke Clement, Shorty Germond, Jim Allen, and Bob Mowery played a 9 hole competition at the Penna. Water Works Operators' meeting. The scores ranged from *59* to *79* (for 9 holes, mind you), whereupon I offered a cup to the man showing the best improvement during the season.

Well, at Atlantic City (N. J. Sect. Meeting) the boys informed me that Bob Mowery had lopped 17 strokes off his early score and a cup suitably inscribed has been ordered for the "winnah."

Now, Tell You What I'm "Gonna" Do! Next year the "Here & There" cup will be presented to the golfer who makes the best percentage improvement in his 18 hole golf score between May 1st and Oct. 1st.

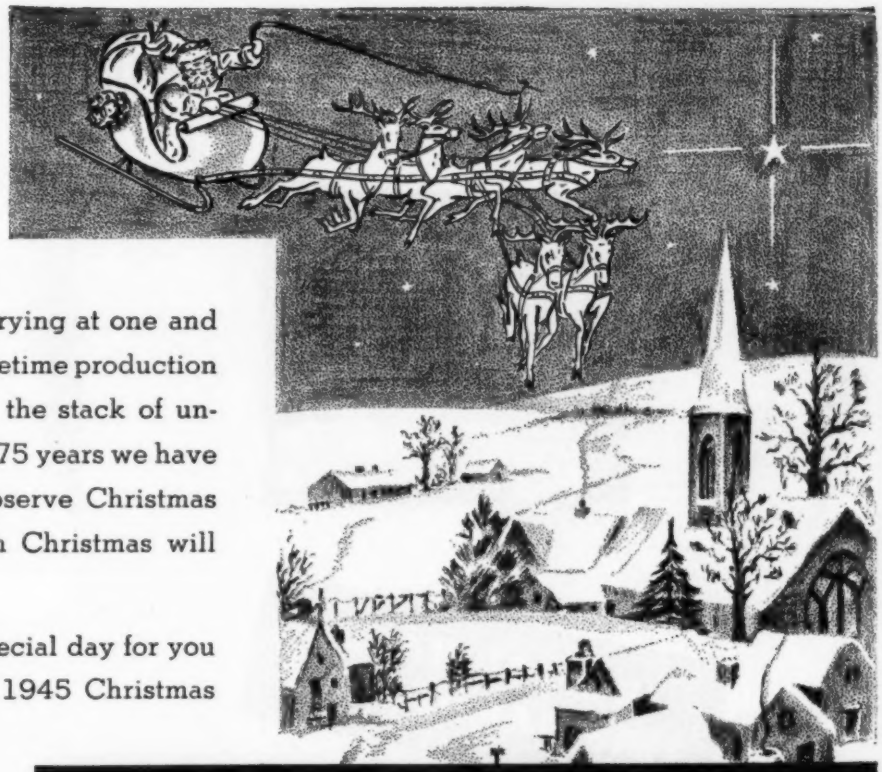
The only rules for this competition: (1) The games must be played at or during some official meeting of a Water Works or Sewage Works organization; and (2) all cards for the competition must be attested by the players and mailed to me within ten days of the game.

* * * *

Brothers Under the Pin: It was at the Elmira meeting of the Central Section of NYSSWA where I had Bill Gyatt and Joe Kieffer of Syracuse in my camera view finder, when I noticed that both of them were wearing Sigma Nu fraternity pins. Turned out that Bill was president of the chapter when Joe was initiated.

I understand that Joe Kieffer was also the first initiate of the Ancient and Honorable Order of Honey Dippers—whatever that is.

Pause for CHRISTMAS



We're busy here at Hays. We're trying at one and the same time to reconvert to peacetime production and to make a daily reduction in the stack of unfilled orders. We're busy, but for 75 years we have never been too busy to try to observe Christmas in deed and in spirit. This 76th Christmas will be no exception.

May this Christmas be a very special day for you and yours. May the glow of this 1945 Christmas candle be so strong that its gleam will guide us all throughout the months of the coming year.

SEVENTY-SIX YEARS — HAYS — SERVICE RECOGNIZED

COPPER · BRASS · LEAD · IRON
WATER WORKS PRODUCTS
HAYS MANUFACTURING CO., ERIE, PA.

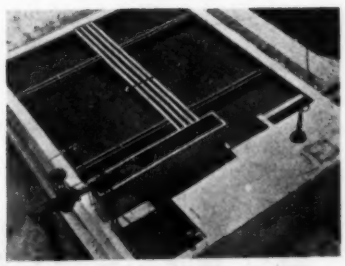
PERMUTIT SPAULDING PRECIPITATOR INCREASES A CITY'S CAPACITY FOR TREATING WATER SUPPLIES . . . AND IN LESS LAND SPACE, TOO!

Expansion of municipal water softening capacity need not mean relocation of water works, or extra space. The Permutit* Spaulding Precipitator, which increases the rate of flow, actually requires *less* space than former methods and provides, in addition, greater economy of operation than previously possible.

In your blueprints, recommend modernization of *present* municipal systems with space-saving, time-saving Permutit Water Conditioning Equipment.

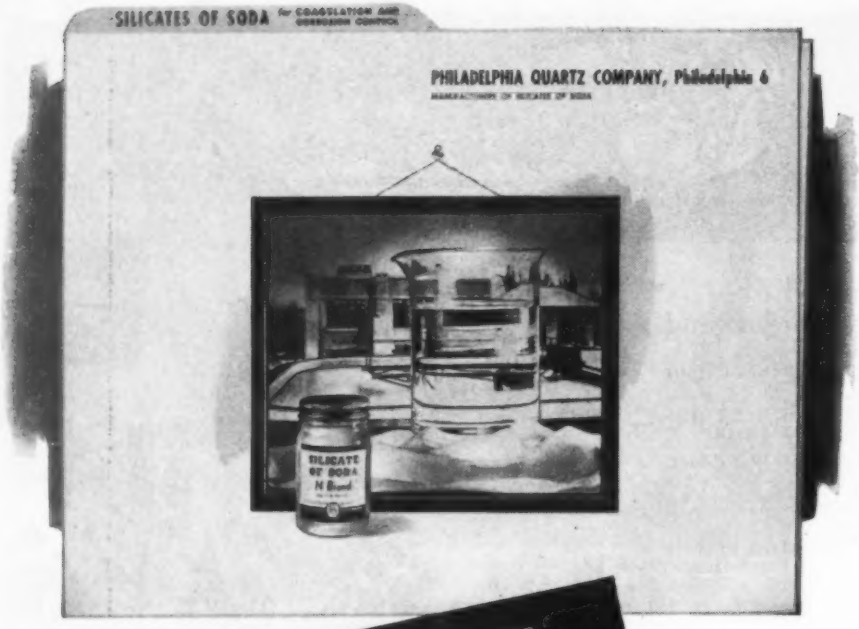
For complete details, address The Permutit Company, Dept. G1, 330 West 42nd Street, New York 18, N. Y. or Permutit Co. of Canada, Ltd., Montreal.

*Trademark Reg. U. S. Pat. Off.



PERMUTIT SPAULDING PRECIPITATOR removes water hardness, dirt and color by the sludge blanket process. This new-design equipment cuts detention time, saves chemicals, takes only half the space of former methods. Present installations handle up to 120,000,000 gallons daily.

PERMUTIT
WATER CONDITIONING HEADQUARTERS



DO YOU HAVE THIS HANDY FILE?

When you are planning new water treatment plants, this file of useful data on chemical water coagulation with the N-Sol Processes answers such questions as —

"How to produce clearer, more sparkling water?"
"How to increase filter runs?"
"How to reduce chemical costs?"
"How to increase capacity?"

Have you a coagulating problem before you now? Write us about it in detail. The return of the coupon below brings you this handy file of technical facts on water treatment. There is no obligation.

Four processes fit any water treatment method — save space, save money.

N-Sol-A* — N Brand reacted with ammonium sulfate. Used where chloramine sterilization is desired.

N-Sol-B — N Brand reacted with alum. Used with any sterilization procedure. (U.S. Pat. No. 2,310,009)

N-Sol-C* — N Brand reacted with chlorine. Used with any chlorine sterilization.

Baylis Sol — N Brand reacted with sulphuric acid. Used with any sterilization procedure. (U.S. Pat. No. 2,217,466)

* Patent Applied For.

Philadelphia Quartz Company, 121 S. Third Street, Phila. 6, Pa.
Please send file on water coagulating processes to:

Name_____

Title_____

Address_____

City & Zone_____

N-SOL PROCESSES FOR WATER COAGULATION

DEVELOPED AND PATENTED BY
PHILADELPHIA QUARTZ COMPANY, PHILADELPHIA 6
AVAILABLE UNDER LICENSE WITHOUT CHARGE

"I only know what I read in the newspapers." And here's a copy of a newspaper clipping sent to me:

...said,
"...an can be occupied with fewer troops, so too probably can Germany."

Radcliffe Still Champion

NEWARK, N. J. OCT. 1. — John L. Radcliffe of Elizabeth successfully defended his title as champion horse shoe pitcher of the State of New Jersey here today. The final match between the champion and Bill Butler of Ocean City was almost a continuous session of ringers. The champ was able to retain his title only because the runner-up occasionally failed to throw a ringer.

In an exclusive interview with the champ after the final match, he was asked what game gave him the greatest pleasure. He stated that the greatest enjoyment he has had at the game was at Red Bank, N. J. during his training period. At that time he played with some friends of his from New Jersey and Pennsylvania. Since they did not know of his prowess, he allowed the opponents to get ahead, and then at the psychological moment he would throw in a ringer to win the game.

P.S.—Jack also received the Fuller Award from the N. J. section.

* * * *

Sat at lunch at the NEWWA Fall meeting with Theodore L. Cate, Sid Anthony, Don Calderwood and Eben Lufkin; conversation turned to native New England cryptic comments.

It was Ted Cate who told the story of the town so small that when a motorist stopped to ask where it was, the reply was, "Back up about four feet and you'll be in the middle of it."

Don Calderwood countered with the motorist who stopped to ask an old-timer how to get to Portland. The old fellow started out to give explicit directions, got as far as "the second corner left," then said "no" and started out with the opposite direction, only to stop abruptly after the first "hill and a holler." The motorist was patient while the old man knit his brows, mentally picturing the roads in the area. Finally, the answer came, "Young fellow, you can't get to Portland from here."

Eben's story was about the old-timer sitting on a stone fence, whittling, when a lady tourist stopped to talk. After questioning the old fellow about what the inhabitants did for amusement in the summer, asked: "And what do you do in the winter?" to which the old fellow replied, "Lady, we don't."

I can't remember Sid's story, but I do remember that he's found a diamond point drill effective in tunneling through rock and hardpan.

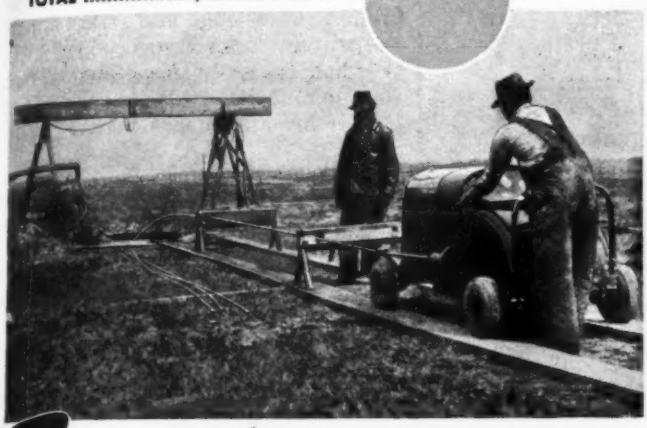
* * * *

Let's give the boy a big hand: When Jo Quinn resigned as Act. Dir.

HOW MUCH DOES A CUT COST YOUR CITY

add it up

Ditch digging .....$_____
Backfilling.....$_____
Patching street ....$_____
Detouring traffic..$_____
Deterioration of street .....$_____
TOTAL .....$_____



Flexible SAVED 52 CUTS on a Single Job

MULTIPLY BY 52 to see how much money Flexible tools and methods saved on a recent job of cleaning 150,000 ft. of water main. Most of the few necessary dig-ups were made in out-of-the-way places where they did not interfere with traffic.

Flexible equipment makes the difference. That's why you'll want Flexible to figure your next job with a statement regarding the number of dig-ups required.

Write or wire your nearest representative. A fleet of fully equipped trucks with complete crews are strategically located.

WE CLEAN WATER MAINS FROM 2" TO 72"

FLEXIBLE UNDERGROUND PIPE-CLEANING CO.

813 Pickwick Bldg. Kansas City 6, Mo.
1624 Harmon Place Minneapolis 3, Minn.
P.O. Box 165, Atlanta
P.O. Box 696 Gulfport, Miss.
61 Greenway St. Staunton, Conn.

9059 Venice Boulevard
Los Angeles 34, California

3645 E. 75th St. Chicago 49
147 Hillside Terrace Irvington, N. J.
P.O. Box 694, Pittsburgh
401 Broadway New York 13
29 Cordon Ave. Roslindale 31, Mass.

Who's Afraid to Drink Water Now?

A recent news item told of a man who had not drunk any water in something like fifty years, because at that time impure water had made him ill.

Of course he was fooling himself when he thought that by drinking other beverages he was avoiding water. It's too bad however, that he blinded himself to the advances in water purification since his unfortunate experience over fifty years ago.

Thanks to Chlorine, every community is assured of safe, palatable water supplies. No one in the United States need be afraid to drink water from a Chlorine protected supply today.

Because of its consistent and dependable high purity Hooker Chlorine has been a favorite among Chlorine users for years. Water Works and Sewerage officials have learned too that they can count on Hooker's Technical Staff to help them solve problems involving Chlorine or any of the other Hooker Chemicals.

Hooker Chlorine can make your job of maintaining high standards of purity easier because of the exacting Hooker specifications. Standardize on Hooker for all your Chlorine needs.

HOOKER ELECTROCHEMICAL COMPANY

Buffalo Ave. and Ward St.
NIAGARA FALLS, NEW YORK

New York, N. Y. **Tacoma, Wash.**
Wilmington, Calif.

HOOKER CHEMICALS

Chlorine *Bleaching Powder*
Caustic Soda *Ferric Chloride*

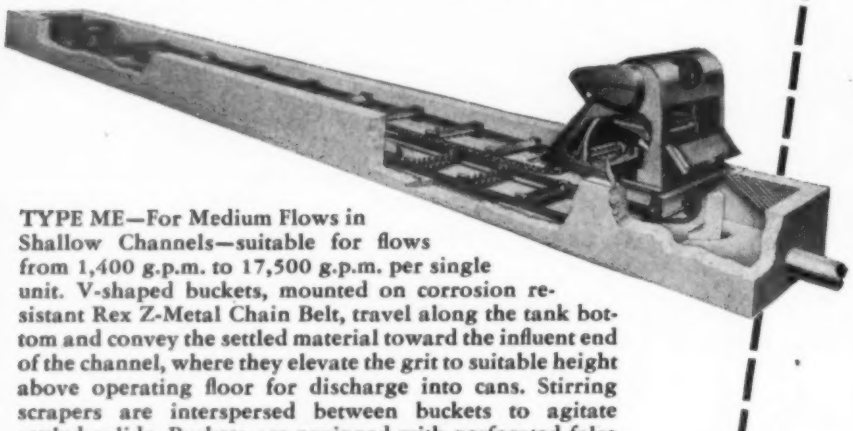
8513

REX GRIT EQUIPMENT

FOR THE EFFICIENT SEPARATION OF SOLIDS

• There is a type of Rex Grit Collector available to meet any set of conditions. All types have incorporated in their design an exclusive recirculation feature that allows improperly separated materials, resulting from unbalanced conditions at low flows, to be returned to the channel during normal flows for resettling.

Grit Chambers, constructed according to standard Rex design principles, achieve highest efficiency through the use of properly proportioned channels of adequate liquid depth. Such chambers provide important control of velocity and distribution over a wide flow range.



TYPE ME—For Medium Flows in Shallow Channels—suitable for flows from 1,400 g.p.m. to 17,500 g.p.m. per single unit. V-shaped buckets, mounted on corrosion resistant Rex Z-Metal Chain Belt, travel along the tank bottom and convey the settled material toward the influent end of the channel, where they elevate the grit to suitable height above operating floor for discharge into cans. Stirring scrapers are interspersed between buckets to agitate settled solids. Buckets are equipped with perforated false bottoms to drain solids before discharge. Rex Grit Equipment also includes Type ME for medium flows in deep channels—Type MI for small flows in shallow channels and a Grit Washer for close separation of putrescible organics from inorganic material.

Specially trained Rex sanitation equipment engineers can help you with your problems. For complete information, write Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wisconsin.

REX SANITATION EQUIPMENT

Triturators • Bar Screens • Tow-Bro Sludge Removers • Slo-Mixers
Aero-Filters • Rapid Mixers • Grit and Sludge Collectors and Grit Washers

CHAIN BELT COMPANY OF MILWAUKEE

Member of the Water and Sewage Works Manufacturers Association, Inc.

of the Indiana State Bureau of Environmental Sanitation, Bob Heider was appointed to fill the job until B. A. Poole returned. B. A. returned about a month later, so Bob didn't have much of a chance, but it was good recognition while it lasted.

* * * *

Speaking of Wendell LaDue, as I often am, reminds me of the Western Pa. Sect. AWWA meeting. One of the papers was read by Miss Murphy, who finds an annoying bacterium in the Pittsburgh Water Supply when there should be none. She wanted to know where it came from.

After the session, Wendell said to me that all he could think about while Miss Murphy was speaking was, "Who threw the overalls in Mrs. Murphy's chowder?"

* * * *

It's news if you haven't heard it: I had to go to Pittsburgh to hear from Hayes Kuhns that my old "super" at Danville, Ill., H. M. Ely, passed on last spring.

Also heard that Walter Klink, who was engineer at the Danville plant when I was there, and since, was made Chief Engineer to fill my Dad's place.

Charlie Bechert of Indianapolis has resigned as head of the Div. of Engr. of the Indiana Conservation Dept., but will remain as the Director of the Div. of Water Resources.

Charlie Fox, Gen. Mgr., Penna Water Co., Wilkinsburgh, Pa., was nominated for the Fuller Award by the West Penna. Sect., "for his contribution to the solving of engineering problems of the water works profession and his untiring efforts to promote knowledge and friendship in the water works associations."

I had to leave the dinner before the nomination was announced so this is my applause, Charlie.

* * * *

Maj. C. C. "Pops" Agar was awarded the Legion of Merit for his work on portable (also potable) water supplies with Patton's famed 3rd Army.

* * * *

In the mailbox: An announcement of the October meeting of the Erie County Chapter of the N. Y. State Society of Professional Engineers—Star attractions, Newell L. Nussbaumer, Comm. of Pub. Wks., Buffalo, and John W. Johnson, Wks. Supt., Buffalo Sewer Authority. The topic—"Theory and Trend of Sewage Disposal." Sorry I couldn't be there, chums.

* * * *

If you thought I was kidding in those verses, "Report to the Nation," last month (yes, it really was a verse), you've forgotten that many a truth is spoken in jest.

* * * *

Buckeye Sludge: E. E. Smith is back in Lima—Lt. Col. F. D. "Dean" Stewart and Mrs. Ruth Landen were married in Columbus—R. F. Snyder did "My Day" in the latest issue—Russell D. Scott, Chief Chemist of the Ohio Dept. of Health, died on Aug. 6—Maj. "Tat" Tatlock is still in service.

* * * *

Have been working with Dr. Norton on Standard Methods for Water and Sewage Examination and one of the interesting things I learned was that his company (Upjohns) did all of their war production at no profit. Wonder what the economists think is wrong with that idea? Sounds O.K. to me—no war profiteering possible under that system.

Bart Marshall says, "Many thanks to W.W.&S. for promoting me to Vice President of Chain Belt when I'm still only Sales Promotion Manager." We were gazing into our crystal ball while typing that day, Bart.

THE SPILLWAY

[Overflow from the main section]

Columbus Informs Its Customers

"Public Water Supply Information," is the title of a booklet prepared by C. B. Hoover, Superintendent, and Charles P. Hoover, Chemist, of the Division of Water of the City of Columbus, Ohio.

This 20-page booklet is prepared for use in disseminating information to the citizens of Columbus on the public water supply of that city. The authors introduce the subject with a discussion of pure water in simple and informative language, the discussion explaining what water is chemically, how it may exist physically, and its passage through the hydrologic cycle as well as the reason for hard water.

Pictures of the present water supply buildings and equipment, as well as a history of the old plant, and the operation of the new plant are included. Time of and reason for peak pumping rates, variations in temperature of water supply throughout the year, and information on the quantity and cost of water delivered are adequately explained in the booklet.

An example of the means by which the authors project technical data into concepts easily visualized by the lay reader is shown in the following paragraph.

"One hundred and eighty thousand tons (about 4,000 tank cars) of water are delivered daily through the streets of Columbus by means of an underground network of pipes. but no one sees any of it in transit, nor are we conscious of the existence of this traffic."

The low cost of water is emphasized by pointing out that the city delivers water to the home for 3.8 cents per ton, "which, of course, is

AMERICA'S largest selling PUMPS provide Water for Industrial Service Domestic Uses & Irrigation

Peerless offers the most complete line of vertical and horizontal pumps. Because of the extensiveness of the line, a pump of the size and exact type best suited for your pumping conditions, which makes for greatest economy of operation, is available to you.

The Hi-Lift illustrated here is furnished in sizes of from 500 to 3,500 gallons per hour. The Turbine type, with either water or oil lubrication, up to 30,000 gallons per minute. The Hydro-Foil (Propeller Type) up to 220,000 gallons per minute.

DOMESTIC WATER SYSTEMS

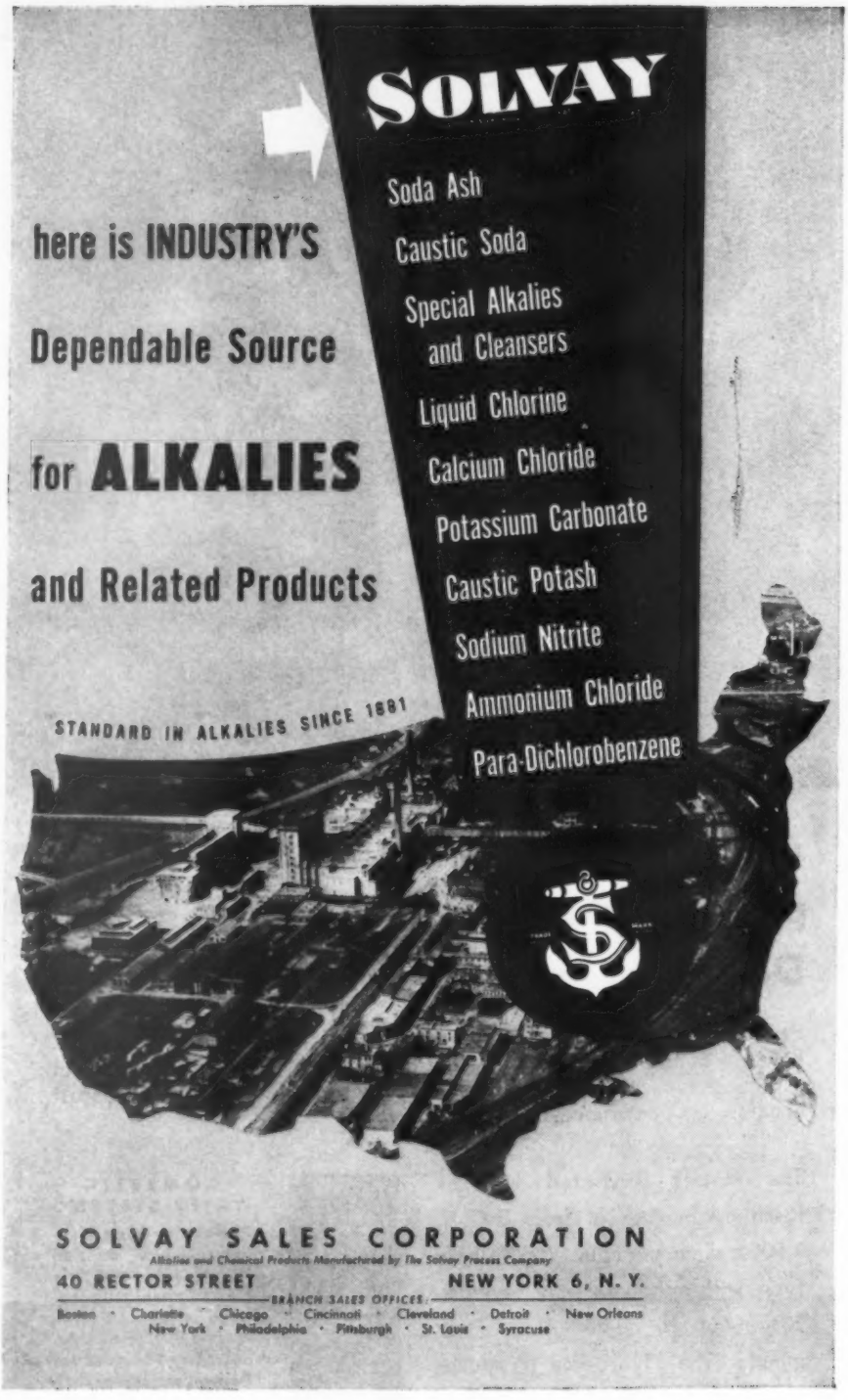
The Water King, shallow well type, utilizing the HI-LIFT principle [left] ingeniously applied in simplest form, up to 1,300 gallons per hour. **The Peerless Jet Pump,** for deep or shallow wells, is available in sizes up to 5,000 gallons per hour.

Peerless Distributors and Direct Factory Representatives Located in All Principal Cities

PEERLESS PUMPS

PEERLESS PUMP DIVISION
Food Machinery Corp.

FACTORIES
LOS ANGELES 31, CALIFORNIA
301 West Avenue Twenty-six
QUINCY, ILL. • CANTON 6, OHIO



cheaper than dirt." And it further points out that for just one penny a person can buy 520 pounds of water which is "more than you can possibly carry," and if a person drinks one half of a gallon of water per day "the cost of his drinking supply per year will be 2.9 cents." This low cost of water is further emphasized in a diagram which shows the cost in dollars per year for a family of five for various services, including carfare, gas for cooking, electric lights, coal, milk, telephone, ice, and newspapers, and water being the lowest of the list.

The effectiveness of water purification and its importance to public health are demonstrated in a chart showing the typhoid fever death rate by periods before and after filtration of the public water supply.

The effort expended by the authors in preparing such a lucid presentation of the water supply functions in a city are more than amply repaid by the better understanding of the consumer of the water utilities problem.

Excellent "Knife" Made of Old Hacksaw Blades

This sketch shows how to make good use of old hacksaw blades. Provide the end with a wooden handle, as indicated, and you are all set for a wide variety of cutting jobs that are otherwise handled with difficulty. For instance, this writer doesn't know of a better "knife" for cutting piston rod packings, for cutting through metal that is not get-at-able with an ordinary hacksaw, and so on endlessly.

There is a hole in the end of every hacksaw blade, which hole can be utilized nicely for fastening the handle with a rivet as indicated by the words "Old Blade Hole." A new hole may be made by heating red hot locally and punching, for the second rivet. Or, make the handle large enough to entirely envelop the blade and insert two rivets, one above and one below the blade. This writer prefers the smaller handle, however, as indicated in the sketch.

To be sure, a "new" blade may be used as well as an old one where greater sharpness is wanted. But for most of the ordinary cutting jobs an old blade will do very well.

(Contributed by W. F. Schaphorst, M. E. Newark, N. J.)

Data on U. S. Water Treatment Plants

Engineering Experiment Station Bulletin Series No. 5 of the Louisiana State University entitled "Source Data on Municipal Water Treatment Plants in the United States," by Dr. M. C. Schwartz, Asst. Prof. of Chem. Engr. and Research Assoc. in Water Technology, retails for 50 cents, and is divided into three parts. Part I contains references wherein may be found information on Analysis of Supplies, Temperature of Water Supplies, Sources of Supplies, and Statistical Summaries on Water Treatment Plants.

Part II contains an alphabetical listing of Municipal Water Treatment Plants in the United States, and under each city are listed the literature references (chronologically) pertaining to that water supply. Part III contains a listing by states of the 605 municipalities tabulated in Part II.

Obviously these do not represent all of the municipalities that have

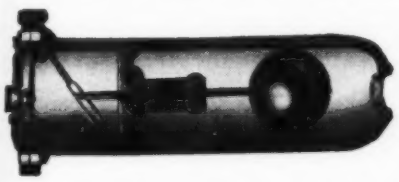
water supplies and probably the list is incomplete as to supplies on which papers have been published.

The data were secured by Prof. Schwartz' students from Chem. Abstracts, Engineering Index, and the Index of the Journal of the AWWA. The author makes no claim "for the completeness of the information" but has "made a serious effort to avoid errors." The bulletin comprising 52 pages may be obtained from the Louisiana State University Press, Baton Rouge, La.

MANUFACTURERS' and EQUIPMENT NEWS

Crispin Sewer Valves

To overcome the problems in air arising in the handling of sewage, the Crispin Sewer Valve has been designed. This sewer valve when installed on an empty line will allow the air to escape until the lower chamber is filled with liquid, causing



the float to rise, thereby closing the relief valve. As air accumulates in the chamber the float is lowered, thereby opening the relief valve whence the air escapes while the cycle is repeated.

These valves, weighing 95 lbs. for a 2-in. inlet are 25 in. high (less nipple) and 10¼ in. in dia., and may be obtained from the Multiplex Mfg. Co., Berwick, Pa.

Ralph B. Carter Co. Expands Services

The Ralph B. Carter Co. of Hackensack, N. J., is expanding its sales and service facilities by the appointment of a number of representatives

Size makes no difference in the quality of R-C blowers. Our smallest size, of 10 CFM capacity, gives the same satisfaction as this big 12,000 CFM unit.

• Nature couldn't change the air for men working inside the Continental Divide tunnel on the great Colorado-Big Thompson irrigation project. Eight miles was many times too far for fresh air to drift in and foul air to work out. Man-built wind-makers went to work.

Through a single 20" pipe line, huge Roots-Connersville blowers alternately supplied fresh air and exhausted foul gases from the face, after blasting. The entire 8-mile length of the east bore (2½ miles longer than driven in any previous tunnel), was kept well-ventilated by a series of R-C blowers, electrically controlled to maintain balance, either blowing or exhausting. The 5-mile bore from the west, driven by another contractor, was similarly ventilated by Roots-Connersville blowers.

R-C equipment is also profitably used for moving air, gas or liquids in small or large quantities. Some applications are:

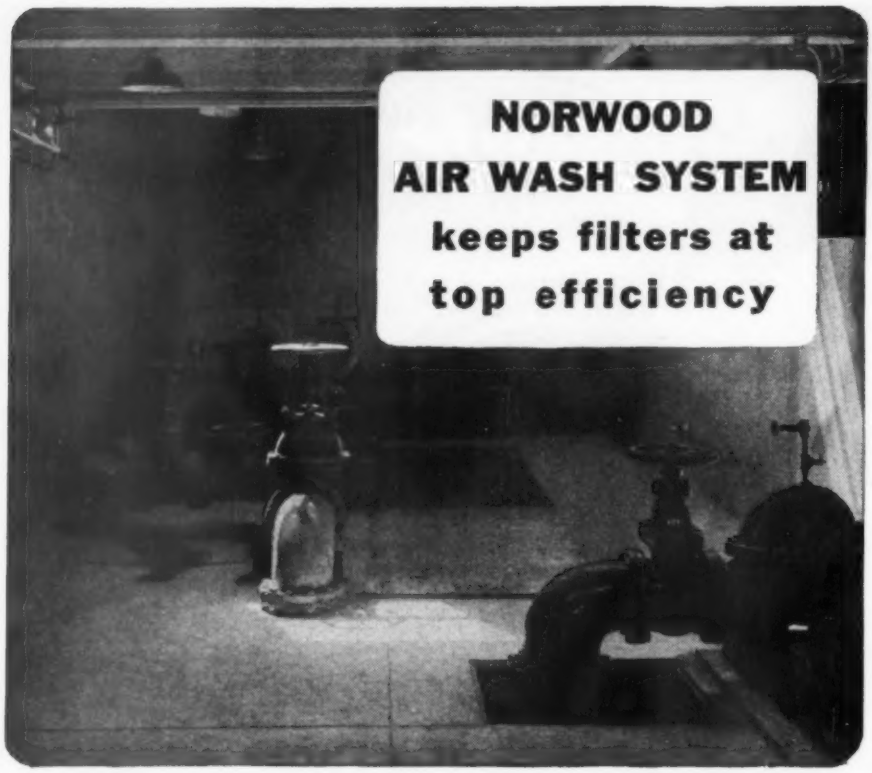
Pneumatic conveying systems	*Grain conditioning*
Supercharging Diesel engines	*Insulation blowing*
Acid-making processes	*Water distillation*
Manufacturing explosives	*Transporting live fish*

Roots-Connersville *dual-ability* to engineer and build equipment for your specific needs is at your service. Call on us without obligation.

ROOTS-CONNERSVILLE BLOWER CORP.
One of the Dresser Industries
512 Mount Avenue, Connersville, Indiana

Roots Connersville Since 1854

ROTARY POSITIVE AND CENTRIFUGAL BLOWERS • EXHAUSTERS • BOOSTERS
LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS



A filter bed is no more efficient than its back-wash system. Thorough cleaning of the filtering medium is essential if operation is to be trouble-free and water volume is to be maintained at design levels.

Norwood's Air Wash System introduces air into the filter unit through a separate brass manifold system at the top of the supporting bed. In this way the air and wash water are introduced simultaneously and excellent scrubbing action of the sand particles results preventing the formation of mud balls in the bed. The high efficiency of this method permits a reduction of as much as 50% in the consumption of wash water in this system.

Norwood invites inquiries from municipal, consulting or industrial engineers regarding any water treatment problem. W-5

Pumps and Valves for Back-Wash System of Norwood Filters at American Brass Co., Ansonia, Conn.

The NORWOOD
ENGINEERING COMPANY
42 N. Maple St.,
Florence, Mass.

The Best For Your Money
NORWOOD FILTERS
In The Long Run

as direct factory agents, according to J. W. Van Atta, Vice Pres. and Gen. Mgr. of the company.

These new representatives and the territories they will cover include: Brooks Equipment Co., Los Angeles, Cal. (California); Henry G. Carter, Tampa, Fla. (Florida); Harry E. Clark & Co., Houston, Tex. (Texas); Ben F. Crabbe, Birmingham, Ala. (Alabama, Georgia, Tennessee and Northern Mississippi); Galigher Co., Salt Lake City, Utah (Southern Idaho, Eastern Nevada and Utah); F. H. Godfrey Engineering Co., Seattle, Wash. (Northern Idaho and Washington); The E. C. Holloway Co., Denver, Colo. (Montana, Wyoming, Colorado and New Mexico); Holloway Engineering Co., New Orleans, La. (Louisiana and Southern Mississippi); Jones-Rogers Co., Cleveland, Ohio (Eastern Ohio); Mecisa, Mexico, D. F. (Mexico); Pasol Engineering Co., Omaha, Neb. (Nebraska and Iowa); Riverside Iron Works, Calgary, Alberta (Province of Alberta); Sherman Machine & Iron Works, Oklahoma City, Okla. (Oklahoma).

Pittsburgh-Equitable Meter and Nordstrom Valve Cos. Become Nucleus of New Rockwell Mfg. Co. with 4 Million Shares of Capital Stock

Willard F. Rockwell, Jr., Named General Manager

At the recent annual stockholders meeting of the Pittsburgh-Equitable Meter Co., it was voted to change the name of the company to the Rockwell Manufacturing Co. and at the same time to split the stock on a four-for-one basis and increase the authorized stock to 4,000,000 shares from the present 500,000 shares.

New Emblem of the Rockwell Industries

The change in name to that of the president and board chairman of the company, Col. Willard F. Rockwell, was prompted by the expansion and diversification of the company's interests. The Pittsburgh-Equitable Meter Co. name will be continued as a subsidiary of the Rockwell Manuf. Co., marketing metering equipment as heretofore. The Merco-Nordstrom Valve Co., a subsidiary of the Rockwell Manuf. Co., has shortened its name to the Nordstrom Valve Co. and will continue production of lubricated plug valves, etc., as before. There has been no change in directorships, officers, personnel, or policies of the companies involved.

In addition to the two companies named, the Rockwell Manuf. Co. is also the parent company of the Rockwell Machine Co., Hopewell, N. J.; The Edward Valve & Mfg. Co., Inc., East Chicago, Ind.; The Delta Manuf. Co., Milwaukee, Wis.; The V. & O. Press Co., Hudson, N. Y.; The Crescent Machine Co., Leetonia, Ohio; Rockwell International Corp., New York; and Monessen Foundry and Machine Co., Monessen, Pa. More than 4,000 people are employed in the various subsidiaries and divisions of the Rockwell Mfg. Co.

Directors of the new Rockwell Co. have elected Col. W. F. Rockwell, President and Chairman of the

They Will PROVE to You How GOOD They Are

PUMPS *"by Aurora"*

No matter how exacting your requirements, there is a size and type of Aurora Centrifugal or Apco Turbine-Type Pump to handle it PERFECTLY. Products of experience. Built by exclusive makers of fine pumps.

NSA Aurora Centrifugal Sump Pump

Aurora Deep Well Turbines for all conditions—4" to 24"

Type AD Hor. Split Case, Two Stage Centrifugal

Type OD Hor. Split Case Double Suction Single Stage Centrifugal

Type G M C Close-Coupled Centrifugal

Apco Turbine-Type Pumps The simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

Type GGU Side Suction Single Stage Centrifugal

APCO Horizontal Condensation Return Unit

APCO Single Stage Turbine-Type

Write for **CONDENSED CATALOG M** *or See Our Catalog in* **SWEETS.**

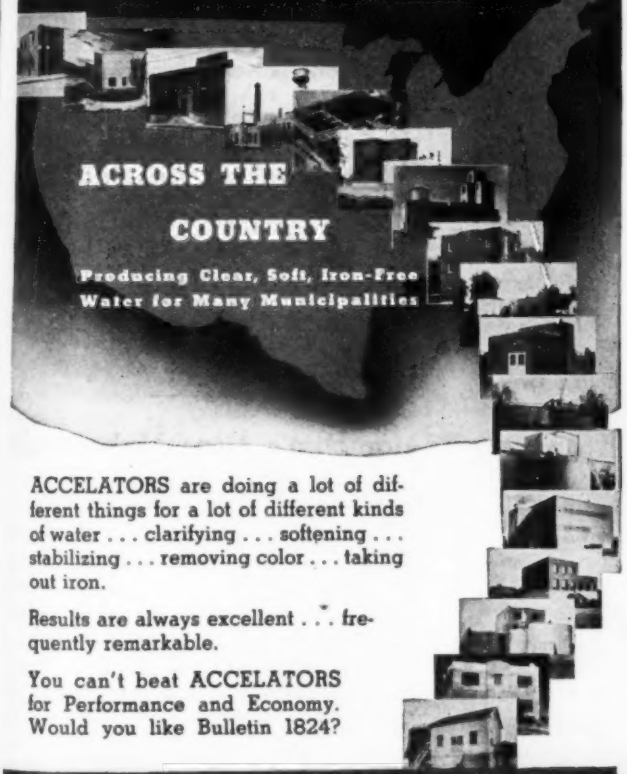
DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

AURORA PUMP COMPANY

68 Loucks Street, AURORA, ILLINOIS

THERE'S A STRING OF THEM NOW



ACCELATORS are doing a lot of different things for a lot of different kinds of water . . . clarifying . . . softening . . . stabilizing . . . removing color . . . taking out iron.

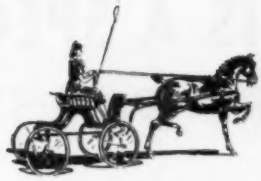
Results are always excellent . . . frequently remarkable.

You can't beat ACCELATORS for Performance and Economy. Would you like Bulletin 1824?

INFILCO

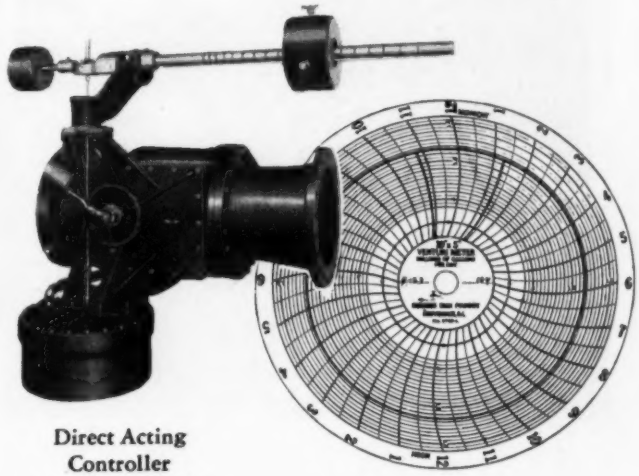
INCORPORATED

325 W. 25th PLACE, CHICAGO 16, ILL.



Look to a Thoroughbred for

PERFECT CONTROL



Direct Acting Controller for Water Works

Reduced from actual chart.

PERFECT RATE CONTROL BECAUSE

Annular pressure-averaging chamber measures the flow more accurately. Superior design avoids air pockets — no hunting. Balanced control valve responds to slightest change in flow. Every bearing is of the anti-friction type — no balancing links or pivots.

TROUBLE-FREE BECAUSE

Molded, flexible rubber piston seal won't rub, catch or reverse. Heavy piston rod of hardened stainless steel will not bend or corrode. Single sturdy control valve blade is arched; can't buckle. Controller requires no power supply; self-actuated. Bronze-lined Venturi throat — Everdur bronze bolts and screws at no extra cost.

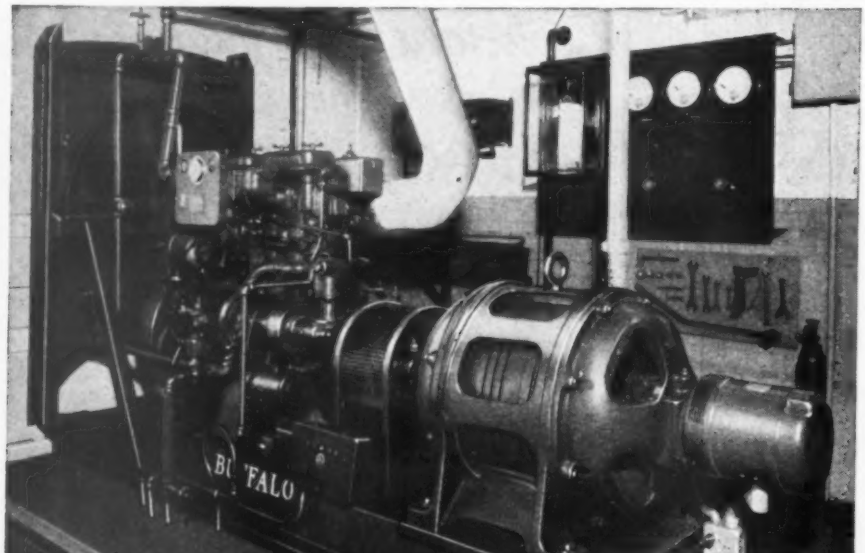
For descriptive bulletins, address Builders-Providence, Inc., 10 Codding St., Providence 1, R. I.

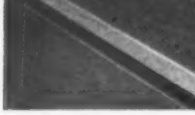
Builders Water Works Equipment: Controllers; Loss, Rate, Sand Expansion and Level gauges; Venturi Tubes, Nozzles and Instruments.

BUILDERS

BUILDERS-PROVIDENCE

RADIO IS A SPECIAL TEST OF STAND-BY POWER EQUIPMENT





Buffalo Engine Model RA-4 four-cylinder, 50 KW, 1200 RPM. Full automatic start-stop control.

"... very IMPORTANT to me as Station Engineer is the fact that the Buffalo power plant has always sprung into action when called upon ... we have had to use it five different periods during public service power failure and it gave us over 25 hours of radio program service".

•

This quotation illustrates the fact that, while thousands of engineering works are protected by emergency power installations, the nature of radio means that its stand-by engines are likely to be called upon with considerable frequency.

BUFFALO ENGINES, with full automatic starting on failure of main power source, provide the split-second response required to maintain the continuity of radio programming.

Whatever your need for stand-by power—whether fire protection, water supply or industrial power—its requirements will be met by a BUFFALO ENGINE.

Engineers and others interested are invited to write for detailed information—bulletins illustrating and describing installations or specification sheets of engines for study and comparison.

Please ask for Bulletin No. 62

BUFFALO GASOLENE MOTOR COMPANY

BUFFALO 13, N. Y., U. S. A.

BUFFALO ENGINES
ASSURANCE of PROTECTION

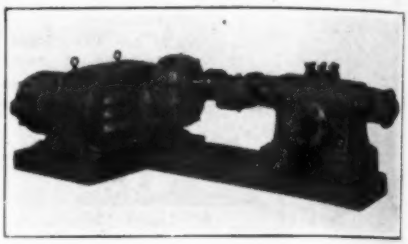
BUFFALO ENGINES — 100 H. P. THROUGH 750 H. P.— IN GENERATOR AND PUMPING SETS FOR WATER WORKS — AIRPORTS — COMMUNICATIONS — FLOOD CONTROL — HOSPITALS — INSTITUTIONS — MINES — MOVABLE BRIDGES — THEATRES — SEWAGE PLANTS.

Board; W. F. Rockwell, Jr., Vice President and General Manager; J. Frank Drake, Vice Pres.; W. S. Potter, Vice Pres. in Chg. of Research, and A. J. Kerr, Vice Pres. in Chg. of Sales; H. A. Phillips, Vice Pres. and Secretary; Edgar W. Meyers, Treasurer, and Edgar W. Meyers, Jr., Controller.

Other Directors are W. F. Crawford, M. H. Ewing, J. L. Merrill, Sven J. Nordstrom, H. S. Shuey and Elisha Walker.

Quimby Improves Screw Pump

The Quimby Pump Co., a division of H. K. Porter Co., Inc. has announced new developments in its balanced quadruplicate screw type pump. These improvements include



the new external bearing pump designed with bracket type anti-friction thrust and line bearings. Precision pre-load anti-friction bearings permit close running clearance between body bores and screws.

This new construction can be provided on all existing pumps without disturbing present pipe connections or location of the motor. This type pump may be used for viscous liquids such as sludge, as well as thin liquids. The H. K. Porter Co. located in Pittsburgh, Pa., will be glad to give further information on this pump.

Homelite's New Lightweight Generators

Two new gasoline engine-driven generators have been announced by the Homelite Corp. of Port Chester, N. Y. Designed as a portable power source for electric tools, floodlights, radio or amplifying equipment, these units are now in production. The Model 21 D, a 2000-watt, 115 volt A. C. generator weighs only 115 lb. Overall dimensions are only 22⅜x 17⅛x21⅛ inches, which coupled with the light weight make the units extremely portable.

Miles Lamb Joins Chicago Pump as Manager Engineering and Development

According to a recent announcement, Miles Lamb, formerly City Engineer of Belvidere, has joined the company as Manager of the Sewage Equipment Division Engineering Department. A graduate of the University of Illinois, Mr. Lamb has had wide experience in the Sanitary Engineering Field. He was formerly associated with Portland Cement Association and later was engaged in the contracting field in the construction of heavy engineering projects.

Miles Lamb

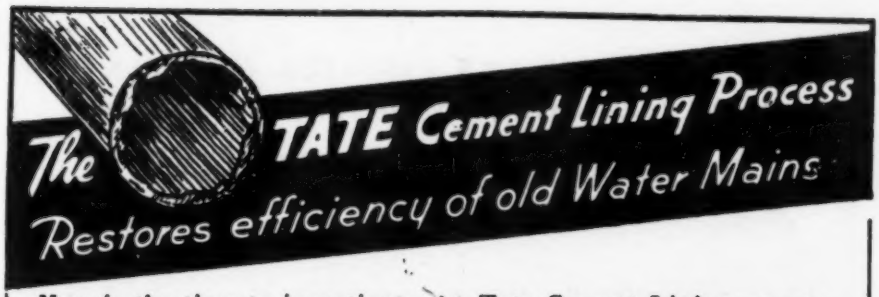
For the past nine years, Mr. Lamb has been City Engineer and Supt. of Sewage Treatment at Belvidere, Ill., where he has become well known for his work in the operation of sewage treatment works and in the design and construction of varied municipal public works projects. In 1940 Mr. Lamb received the Professional Degree of Civil Engineer from the University of Illinois for experimental work on the Oxygen Demand of Activated Sludge.

Mr. Lamb is President of the Rock River Chapter of the Illinois Society of Engineers, a member of the Central States Sewage Works Association, a member of the Illinois Conference on Sewage Works Operators and a member and past Chairman of the Illinois Sewage Works Operators' Certification Committee.

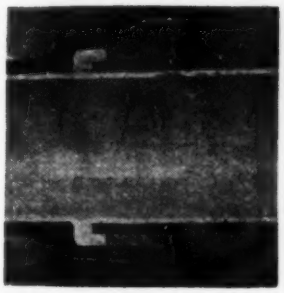
Brooks Rotameter Co. Formed

Stephen A. Brooks and seven associates, each with extensive experience in rotameter manufacture and application, have organized the Brooks Rotameter Co., a corporation capitalized at $100,000.00. A factory has been acquired at Lansdale, Pa., with 18,000 square feet of floor space and manufacture has been started upon all types of rotameters for flow rate measurement and control.

Stephen A. Brooks



Now is the time to investigate the Tate Cement Lining process —and see what it can do to restore the efficiency of your old water mains.



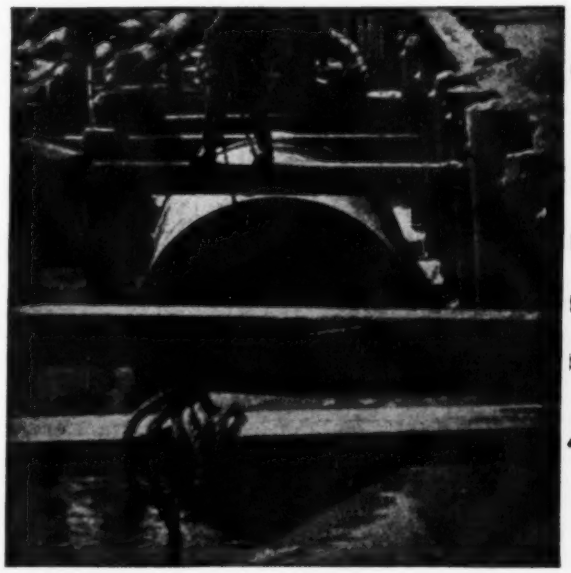
View showing Tate Process in Pipe Joint. Note thoroughness of Lining.

Write for Literature.

What the TATE Process accomplishes

1. Water mains cleaned and cement-lined without removing pipe.
2. Eliminates discoloration and further cleaning costs.
3. Reduces pumping costs.
4. Restores reduction in head and flow co-efficients. This means full fire protection and lowered insurance rates.
5. All joints cement-lined . . . just one continuous pipe.
6. Does the job without interruption of service to consumer.

TATE PIPE LININGS, Inc.
ANDOVER, MASS.



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

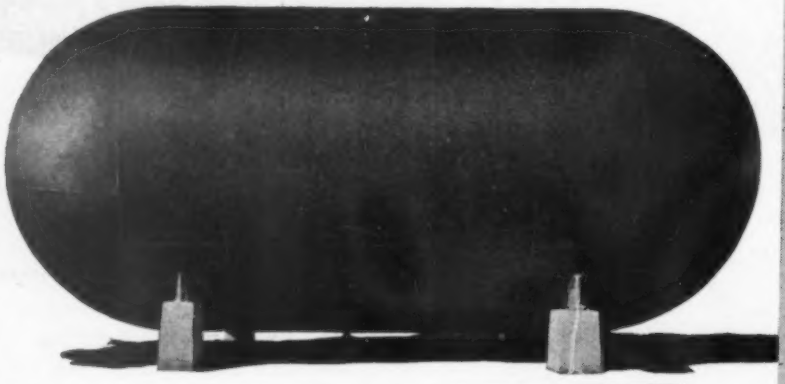
SIZES 3" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

A TYPICAL SEWAGE DIGESTER GAS TANK
DESIGNED...FABRICATED...ERECTED BY STACEY BROTHERS



DELIVERED COMPLETE...
READY FOR YOU TO TURN ON
THE VALVE

THIS is called the "Bullet". It blends right into the most dignified suburban landscape.

Its design is just as practical as it is beautiful. Being comparatively low it costs less to erect and is easier to maintain. Special interior bracing assures permanent shapeliness and tightness. As you can see in the picture, foundations are simple and economical.

Stacey Brothers "Bullets" can be erected either horizontally or vertically. Production models available to withstand up to 100 pounds pressure; higher pressures on specification.

Captured sewage digester gas will pay for this tank in a short time. Don't delay. A penny postcard will bring you complete facts. Address it to:
Stacey Brothers Gas Construction Company, One of the Dresser Industries, 5535 Vine Street, Cincinnati 16, Ohio.

Stacey Brothers
TANKS

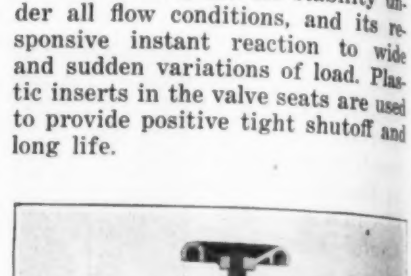
Mr. Brooks is a graduate chemical engineer with a wide experience in chemical engineering and instrumentation. For the past six years he has been Vice President of Fischer & Porter Co., in charge of sales and advertising. The eight men founding this new Company have an aggregate of 40 years' experience in rotameter engineering. The address of the Company is the Brooks Rotameter Company, Box B-2811, Lansdale, Pa.

Harry H. Long will be Chief Fluids Engineer in control of specifications and calibrations, assisted by James Anthony and Joseph Ducsik. Garbutt W. Aiman will be at the head of precision rotameter tube manufacture; Jack Bradley will manage production and Lou Rosenblum will handle purchasing and accounting.

The company will specialize in rotameter flow rate measuring instruments designed to meet the severe applications and corrosive atmospheres encountered in the process industries. Their new meters have been so simplified that they will meet this high standard at no increase in cost. Exact design announcements will appear later.

Leslie Announces New Air Reducing Valve

A new and improved type of internal pilot operated Air Reducing Valve (Class L-1A) has been announced by Leslie Co., Lyndhurst, N. J. Among the main features of this new valve, are its stability under all flow conditions, and its responsive instant reaction to wide and sudden variations of load. Plastic inserts in the valve seats are used to provide positive tight shutoff and long life.



While the new valve was developed during the war primarily for use on diesel-powered ships and smaller boats, it would appear to have many industrial applications because of its range of from 5 to 300 psi. output for initial pressures up to 400 psi.

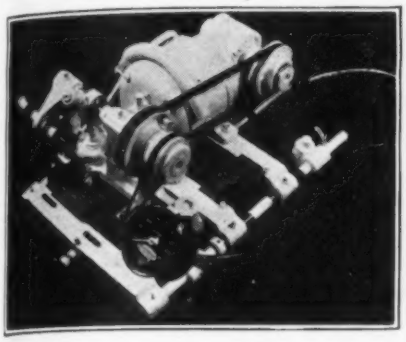
The new valve is available in sizes from ½-in. to 4-in. and there is a companion valve, Class JA-1 for smaller sizes. These new valves are obtainable from Leslie Co., 191 Delafield Ave., Lyndhurst, N. J.

New F-M Distributors in N.W.

Fairbanks Morse Co. has announced that the Milwaukee Machinery Co. of Portland, Ore., has been appointed agents for the complete F-M line of pumps and equipment, including the Pomona Pump and Oil Lubricated Turbine Pump. The Milwaukee Machinery Co. will also handle sales and service for the Niagara Propeller and Mixflow Pumps and the Westco Horizontal Turbine Type Pumps, all products of Fairbanks Morse.

Morse Boulger Acquires Chem-Feeds

Morse Boulger Destructor Co. of New York has purchased Chem-Feeds, Inc., Providence, R. I., and will carry on the business as the Chemical Feeders Division of Morse Boulger Destructor Co. Chem-Feeds, Inc., was started and developed by Jeff Corydon, II, well known in the proportional feed field, and Mr. Corydon will head the new division of Morse-Boulger.



The accompanying photograph shows the latest design in the Varifeeder, the company's principal product. This apparatus, which will pump at speeds up to 400 strokes per minute, is controlled by a simple knob and can be varied during operation. It may be used for feeding any wet chemical and against pressure where required.

New M.S.A. Protective Mask Generates Its Own Oxygen

The Mine Safety Appliances Co. has announced a radically new development in respiratory protection known as the M.S.A. Chemox Oxygen Breathing Apparatus. This apparatus, employing a replaceable chemical canister, generates its own oxygen and gives the wearer one hour's protection in unbreathable air. Weighing but 13½ lbs. complete, and with no cylinders, high-pressure valves or fittings, the new Chemox unit employs unique principles to generate its own oxygen supply, operating independently of the outside air. For the first time in the history of science, this chemical combination in a simple canister creates oxygen—*by merely breathing into it.* Exhaled breath passes from the "All-Vision" Facepiece of the apparatus through the exhalation tube and into the canister where carbon dioxide is removed. Evolved oxygen flows into the breathing bag reservoir, then to the facepiece through the inhalation tube.

IN nearly every war-producing area, there has been one or more "war casualties" among sewers and drains . . . particularly in industrial plants discharging chemicals and acids into lines not intended to carry this type of waste. The result has been expensive plant shut-downs, costly repairs and replacements.

In no instance has Clay Pipe appeared on any list of systems put "out of action" by corrosion — pipe enemy No. 1. That's because Clay Pipe is completely inert to corrosion . . . its hard, tough texture resists the attacks of acids, chemicals and all kinds of industrial wastes, including hydrogen sulphide from septic sewage and acid soils.

In your reconversion plans, play safe by specifying Clay Pipe . . . the all-purpose pipe for sewers and drains . . . which handles whatever waste comes its way. Once installed, it lasts for generations . . . *it never wears out.* In the long run, Clay Pipe is *the most economical pipe.*

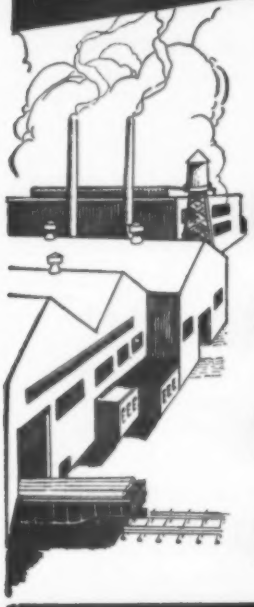
For information or engineering literature from one of the regional association offices write to:

NATIONAL CLAY PIPE MANUFACTURERS, INC.
111 W. Washington St., Chicago 2, Ill.

C-845-3

CLAY PIPE

HILL-HUBBELL
4
BASIC
ADVANTAGES
IN
MODERN FACTORY
APPLIED STEEL PIPE
PROTECTION • • • •



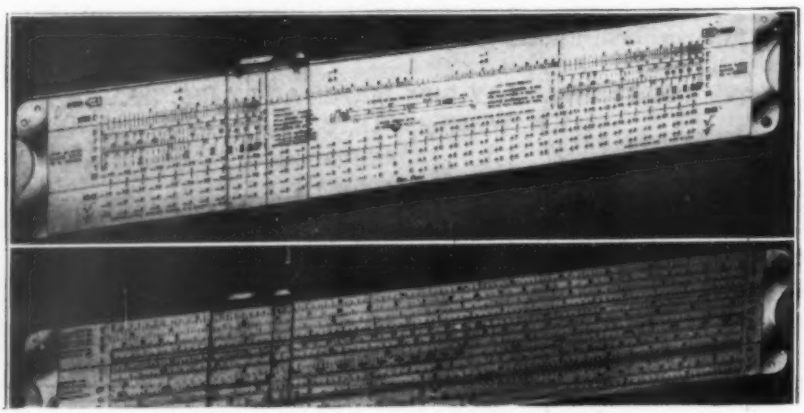
MACHINE PROCESSING—Cleaning — Priming — Coating — Wrapping — and — Akwalining done under exacting mechanical methods.

MODERN LINE PRODUCTION—all under one roof with controlled conditions, insuring prompt service with efficient workmanship.

WARRANTED RAIL DELIVERY—HILL-HUBBELL mechanically processed steel pipe assures investment protection.

HILL-HUBBELL PROCESSED PIPE — eliminates delays, saves time and labor, ready for installation upon arrival.

GENERAL PAINT CORPORATION
HILL, HUBBELL & CO. • Division • Cleveland, Ohio
• EXPORT OFFICE: SAN FRANCISCO, CALIFORNIA, U. S. A. •



The M.S.A. Chemox Self-Generating Oxygen Breathing Apparatus is simple to use, and can be worn and operated without special training. It is quickly put on, and the replaceable canister does the whole job. Before the canister is exhausted, a pre-set alarm bell rings a warning to replace the canister with a fresh one. The M.S.A. Chemox Apparatus, a war development, is now immediately available for civilian use, and a descriptive bulletin (BM-8) can be had on request to Mine Safety Appliances Co., Pittsburgh, Pa.

Dow Corning Silicone Greases

Since the introduction of the Dow Corning Silicone Greases DC 31 and DC 41, two new greases, DC 33 and DC 44 have been developed while the former have been improved. The two latter greases are serviceable in ball bearings at speeds up to 10,000 rpm. with bleeding of less than 2 per cent after 16 hours at 110°C (230°F.) The DC 33 grease is effective from 44°F. to 300°F and the DC 44 covers the range from 4°F to 345°F. Their low volatility and slight tendency to bleed recommends them for sealed in lubrication as well as operation at abnormal temperatures, either high or low.

New Deci. Point Slide Rule

After many, many years of slide rule history, a new development has been announced by Pickett & Eckel, Chicago. This new slide rule is the Deci. Point Slide Rule, so named because it will place the decimal point accurately in long and intricate computations. Manufactured of light weight Dowmetal, the rule has many mechanical advantages but its principal point of interest is its mathematical advantage. With a simplified arrangement of scales, the slide rule is easy to operate and will locate the decimal point in the operation; give the cube and square roots as well as logarithm of the result all from the same hair line setting; and give 30-in. scale accuracy for cube root, and 20-in. scale accuracy for square root.

The Deci. Point Slide Rule is 12⅛ inches long and two inches wide, and is supplied with carrying case and a manual developed by Maurice L. Hartung of the Univ. of Chicago. For price and further details write Pickett and Eckel, 53 W. Jackson Blvd., Chicago 4, Ill.

TOO frequently the accomplishments of Purchasing Agents and their staffs have been overlooked in discussions of American industrial might. In emphasizing production records, Purchasing achievements in providing raw materials often are omitted . . . in praising scientific and technical advances, the ingenuity of Purchasing men in locating and obtaining scarce products frequently is unnoticed.

Yes, through long hours of diligent, resourceful work, American industrial Purchasing Agents have turned in a superlative job. In paying tribute to them, Columbia renews its pledge of continued co-operation to its customers' Purchasing Agents and their staffs as they face today's new problems and responsibilities.

COLUMBIA CHEMICALS

PITTSBURGH PLATE GLASS COMPANY • COLUMBIA CHEMICAL DIVISION
GRANT BUILDING, PITTSBURGH 19, PENNSYLVANIA

Chicago • Boston • St. Louis • Pittsburgh • New York • Cincinnati • Cleveland • Philadelphia • Minneapolis • Charlotte • San Francisco

EDDY

FIRE HYDRANTS AND VALVES
WATER WORKS EQUIPMENT

EDDY VALVES
For
Water Works
and
Sewage Disposal
Plants

EDDY FIRE HYDRANTS
For Fire Protection Service

Write for Complete Catalog

Eddy
VALVE COMPANY
WATERFORD N.Y.

Remote Valve Control Assembly

A remote valve control assembly has been developed by the Zurn Manuf. Co. to facilitate the control of valves in hard-to-get-at places. Operating from an easily accessible control board, these assemblies will open or close valves located below floor level, near ceilings or walls, inside tanks, or in the midst of complicated installations of piping and equipment.

The assembly consists of a flexible cable for transmitting torque to the handle of the valve to be operated, a remote control box, rod coupling for the valve wheel, and accessories. A rod or pipe connected by universal joints may be used in place of the cable as desired. The boxes are made in cast bronze, steel, semi-steel, or iron and may be attached to masonry, metal, or wood. These remote control assemblies are manufactured by the J. A. Zurn Mfg. Co., Erie, Pa.

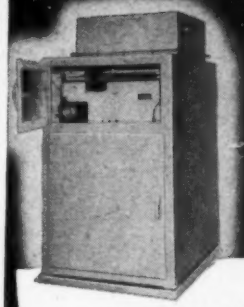
Macbeth's New pH Meter

A newcomer in the pH meter field has been announced with the introduction in December of the MacBeth line-operated pH Meter. The simplicity of operation of this new pH meter will make possible the use of adequate pH control in many operations.

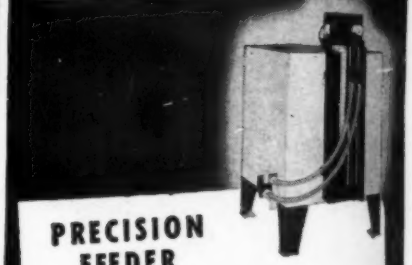
Only one control is used in addition to the electrode switch, greatly increasing the ease of operation, and pH values are read directly on the scale in 0.1 units over the full range from pH 0 to 14. No batteries are used and the meter may be left on continuously.

This new Macbeth line-operated pH Meter will be sold only through laboratory supply dealers, but a bulletin describing the meter may be obtained from the Macbeth Corp., 227 W. 17th St., New York 11, New York.

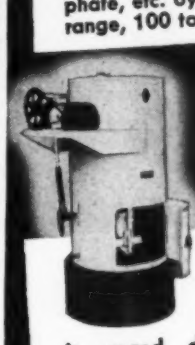
NEED A CHEMICAL FEEDER?
Specify an
OMEGA



GRAVIMETRIC FEEDER
"Loss-in-weight" Type
The most accurate type chemical feeder . . . weighs, feeds and records dry materials within 1% of rate set on feed dial.



PRECISION FEEDER
For Liquids
A true volumetric feeder, accurate within 1%, for feeding solutions of hypochlorite, Calgon, Copper Sulphate, Ammonium Sulphate, etc. by gravity . . . feeding range, 100 to 1.



UNIVERSAL FEEDER
A rugged, dependable Volumetric dry feeder, simple in design, handles lumps or powder without clogging. Easy feeding rate adjustment.

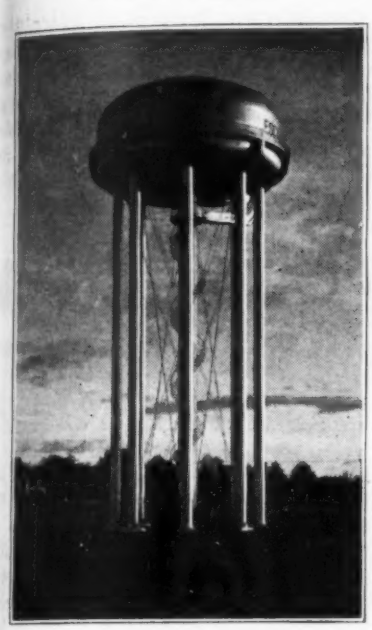
The Omega line of chemical feeders is complete. Write for Bulletins

Sincerely
OMEGA MACHINE CO.
(Division of Builders Iron Foundry)
10 CODDING ST., PROVIDENCE 1, R. I.

Ace to Handle Ferguson Devices

Following the death of S. F. Ferguson of Newark, maker of valve and box locating devices as well as water main leak locating equipment, the business has been taken over by the Ace Electrical Appliances, 2138 N. Wolfe St., Baltimore 13, Md.

Tanks Again!



Chicago Bridge's First Post War Tank

The accompanying photograph shows the first post war elevated water tank built by the Chicago Bridge and Iron Co. after wartime restrictions were removed. This tank which has a capacity of 500,000 gallons is of the radial cone bottom type. Constructed at Escanaba, Mich., it stands 110 ft. from the ground to the bottom of the tank.

Byers Establishes Atlanta Office

The A. M. Byers Co., Pittsburgh wrought iron manufacturers, has announced the establishment of a divisional office at Atlanta, Ga., to serve a five-state area. This new office will serve the increased industrial activities in the southern states and will be under the management of James A. Cain, of Atlanta, formerly assistant manager of Byers' Pittsburgh Division. Headquarters will be at 817 William Oliver Building, Atlanta, and the Atlanta Division will include Georgia, North and South Carolina, Florida, Alabama and parts of Tennessee.

CEMENT GUN COMPANY

"GUNITE" CONTRACTORS

GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.

"GUNITE" SAVES FOUNDATIONS

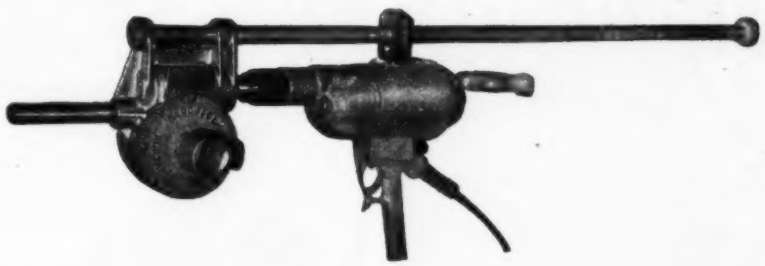
The "before" and "after" photos show two of three water standpipe foundations which we restored in 1944 for the Village of Carthage, N. Y.

These foundations were very seriously disintegrated and in dangerous condition. All loose and deteriorated concrete was chipped away and mesh reinforced "GUNITE" placed 3" to 12" thick to restore the foundations to original dimensions. Extreme care was taken to place "GUNITE" well under the bearing edges of the standpipes.

This work was done under the supervision of Mr. J. Lamprecht, Consulting Engineer, Fayetteville, N. Y.

Our 72-page bulletin C2300 describes scores of uses of "GUNITE". Write for your copy.

MANUFACTURERS OF THE "CEMENT GUN"



RENSSELAER-BARDWELL

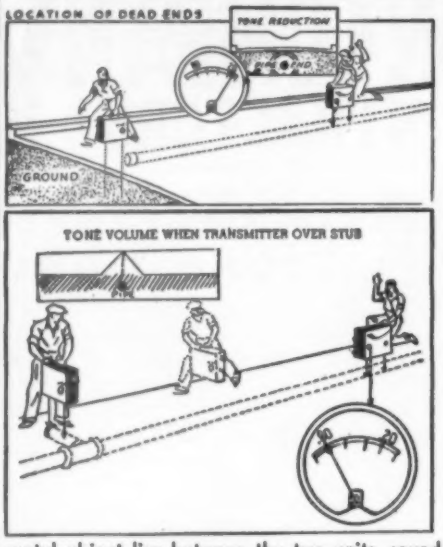
PORTABLE POWER WRENCH

wherever ***High Torque at Low Speed*** is required

Successfully used for operating **GATE VALVES,** Sluice Gates, Pipe Cutters, Pipe Tapping Machines, Hoists, Jacks, etc. Supplied with or without Drill.

Write for Bulletin B-45

RENSSELAER VALVE CO., TROY, N. Y.



M-SCOPE

Buried Pipe Finder and Leak Detector

FREE 16 PAGE BOOKLET UPON REQUEST

The M-SCOPE consists of a specially designed radio Transmitter and Receiver, with conductive wire. In operation, the Transmitter sends out a continuous signal, and when there is no metal between Transmitter and Receiver, a definite volume of sound is heard in the Receiver earphones and the meter (mounted on Receiver) gives a definite reading. If a metal object lies between the two units, sound in earphones is louder and meter reading higher—and the pipe or other metal object is located.

The M-SCOPE is solving — successfully — the varied problems involved in the development, operation and maintenance of buried pipe and cable systems and is in daily use by representative organizations in such important groups as:

- Government Projects
- Municipalities
- Sewerage and Water Plants
- Consulting Engineers
- Airports
- Public Utilities
- Industrial Plants
- Oil and Pipeline Companies

Write for further particulars and booklet:

FISHER RESEARCH LABORATORY

Direct Teletype — PALO ALTO, CALIFORNIA

HYDRO-TITE

HYDRO-TITE — the self-caulking joint compound that makes cast iron water pipe joints — strong — tight — flexible and everlasting. Used on thousands of miles of pipe with a record of more than 30 years without a failure.

FIBREX — The sanitary paper packing that is used like braided jute. Free from bacteria — treated with a water repellent — put up in 60 pound reels. 70 pounds of Fibrex takes the place of 100 pounds of braided jute.

HYDRAULIC DEVELOPMENT CORPORATION
50 Church St.
New York, N. Y.

DRY BRAIDED
Fibrex

TYPE X SINGLE LID Meter Box COVERS

These modern covers for water meter settings have the Lifter Worm Lock plus a hinge-effect feature which permits the lid to be leaned back for meter reading, or lifted off if desired. Made in several sizes and depths.

Write for catalog now.

FORD Meter Box Co.
WABASH, INDIANA

Mr. Cain has been associated with the Byers organization since 1942. He started as a field service engineer, and since May 1, 1944, has been assistant division manager of the Pittsburgh Division, in which capacity he was responsible for all of the southern territory that is now included in the new Atlanta Division.

New Type Flexible Utility Tubing

The Warner Bros. Co., Spiratube Division, of Bridgeport, Conn., has announced a new construction principle in flexible tubing. This tubing which may have a use in portable ventilating or for handling air in and about plants, is non-collapsible

under plus and minus pressures. It is retractable to about one-eighth of its extended length and contains a spring helix core to maintain its length and shape under working conditions. The inside surface is free from ridges, and the tubing may be bent sharply with but a slight reduction in air flow.

Spiratube is furnished in standard diameters from three to 16 inches and in lengths of 10, 15, and 25 feet. Built-in couplings serve for quick jointing. A bulletin on this new tubing is available from Warner Bros. Co., Spiratube Division, Bridgeport, Conn.

Homelite Opens Seattle Office

"Doug" Sherwood to Be in Charge

The Homelite Corporation, Port Chester, N. Y. has opened a new branch office in the Terminal Sales Building, Seattle, Washington. A. D. Sherwood, who will be in charge of the office, was recently released from active duty with the United States Navy after serving over two years as a lieutenant in the Naval Air Corps. Before the war, "Doug"

A. D. Sherwood

Insure Public Satisfaction

Be certain that your community always gets palatable water. Use Hydrodarco as your purifying agent. It is the quality activated carbon with the adsorptive action that eliminates odors and disagreeable tastes. Standardize on Hydrodarco for dependable performance at low cost.

HYDRODARCO
REG. U. S. PAT. OFF.

DARCO
CORPORATION

60 East 42nd Street, New York 17, N. Y.

Distributing Points: New York • Buffalo • Cincinnati • Chicago • St. Louis • Kansas City • San Francisco • Los Angeles • Marshall, Texas

Sherwood was a salesman for Homelite in the Charlotte, N. C. area.

To provide quick service for Washington, Oregon and Idaho, the Seattle office will carry a complete stock of Homelite parts and is fully equipped for repair and overhaul work.

New Industrial Soldering Irons

The Industrial Heating Division of the General Electric Co., Schenectady, has announced a new and improved line of industrial soldering irons. These irons range from 75 to 300 watts and are available with tips from ⅜ to 1¼ inches.

These new irons are designed primarily for severe and exacting soldering operations where fast, continuous high quality soldering is required.

Metco Type Y Metallizing Gun

A metallizing unit known as the Metco Type Y Metallizing Gun is a new and different gun developed for

heavy-duty continuous operation. It is constructed primarily for mounted, mechanical operation, rather than for hard use. Using 3/16-in. wire and 15 psi. acetylene pressure this unit doubles previous spraying speeds. There are other new features of design and construction in this unit which may be obtained from the Metallizing Engineering Co., 38-14 30th St., Long Island 1, N. Y.

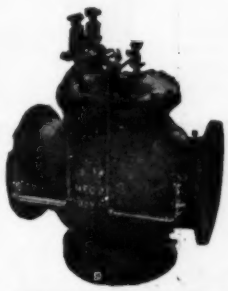
Westinghouse Offers New Grease for Motor Bearings

Westinghouse Electric Co. has announced a new grease for ball and roller bearing motors. Available in a light weight nasal type tube, the grease is stable, resistant to oxida-

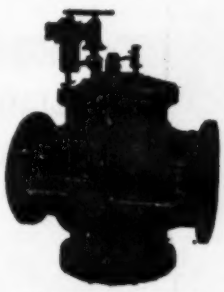
· 1879 ·
ROSS
AUTOMATIC VALVES

ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES • FLOAT VALVES • REDUCING AND REGULATING VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs, hydraulic control.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.
4. Can be equipped with electric and manual controls.



COMBINATION VALVE
This valve will permit flow in one or both directions acting as
1. Pressure Reducing and Relief Valve.
2. Pressure Reducing and Altitude Valve.
3. Relief and Altitude Valve.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.

WRITE FOR INFORMATION

VOGT BROTHER'S TRAFFIC MODEL FIRE HYDRANT

A.W.W.A.

VOGT BROTHERS MFG. CO.
Incorporated
MAIN AT 14th LOUISVILLE, KY.
VOGT
VOGT MFG. CO., Incorporated
P. O. BOX 1122 LOUISVILLE, KY.

AERO-MIX
AERATOR-MIXER

A Size and Type to Fit Your Problem in Water or Sewage Treatment.

WRITE FOR INFORMATION

tion and drying, and will give dependable lubrication from 13 to 176° F. for all speeds up to 3600 rpm. in either horizontal or vertical operation.

LITERATURE AND CATALOGS

Write to The Pennsylvania Salt Manuf. Co., Philadelphia, Pa. for an attractive booklet on **Quaker Improved Chlorinated Lime.** According to this booklet, new methods of manufacturing and improved conditions for controlling the manufacture of chlorinated lime have resulted in better stability characteristics, more uniformity and a lower moisture content. This product conforms with every requirement of the Chemical Warfare Service Specification No. 197-54-281B covering Grade-2 "bleaching powder." Quaker Improved Chlorinated Lime is an economical source of chlorine for use in sewage disinfection, water treatment, bleaching of textiles, pulp paper, and cotton linters.

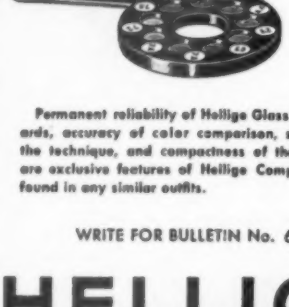
* * *

Now that the Chicago Filter Plant is in operation, the work of John Baylis on turbidity comes to mind. Perhaps it is appropriate therefore that we should have recently received a folder on the **Baylis Turbidimeter** manufactured by the Ferguson Co., of Baltimore, Md. This folder describes the Baylis Turbidimeter for Making Accurate Measurements of Low Turbidity Using The Tyndall Cone Principle. The design is shown and directions for use are given. The folder may be obtained from the Ferguson Co., Baltimore; the Baylis Turbidimeter may be obtained from the manufacturer or any laboratory supply house.

* * *

It is not without some pride that the latest issue of **Silicate P's & Q's** (the external house organ of the Philadelphia Quartz Co.) points to an unbroken record of twenty-five years of publication. It has the right to be proud on its Silver Anniversary. It is an interesting and informative sheet, which, while admittedly introducing each issue with a "decoy" paragraph to lure the reader into a discussion of sili-

FOR BETTER
pH Control
and WATER TESTS
there is nothing like



NON-FADING
GLASS COLOR
STANDARDS

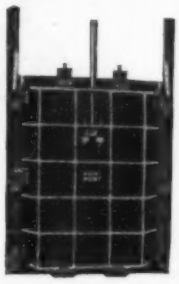
Pocket Comparator No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of the technique, and compactness of the apparatus are exclusive features of Hellige Comparators not found in any similar outfits.

WRITE FOR BULLETIN No. 602

HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.
HEADQUARTERS FOR COLORIMETRIC APPARATUS

RODNEY HUNT



GATES and HOISTS

Metal or timber sluice gates of all sizes and designs, approved by engineers everywhere. Improved gate stands and hoists for hand or motor operation. Also flap and mud valves, shear and filler gates, trash racks and rakes. Dependable canal equipment from dam to tail-race since 1840.

Write for Special Catalog Today!

RODNEY HUNT

RODNEY HUNT MACHINE CO.
118 Lake St., Orange, Mass., U. S. A.

AUTOMATIC "STOP-STARTER"
GOLDEN-ANDERSON
ALTITUDE VALVES

Eliminate all water surges and shock.

Installed where a single line is used for both supply and discharge, the valve will maintain a constant water level within 3" to 12" variation and by means of the "stop-starter" switch stops the pump as the valve closes.

Let GOLDEN-ANDERSON Engineers Solve your Flow Control Problems.

GA
GOLDEN-ANDERSON
VALVE Specialty Company
FULTON BUILDING • PITTSBURGH 22, PA.

cates, seldom fails to hold his interest for the remainder of the page. Beginning with but five issues in 1921, the sheet has since appeared regularly each month. For twenty years it was edited by James G. Vail, a Vice President, and since then by C. H. Jeglum.

This 25th Anniversary number says that "a serious attempt is made to provide substance as well as entertainment," and frankly confesses that, besides selling the uses of silicates, it hopes to sell Philadelphia Quartz as the source of supply. But whether you buy or not, P's & Q's makes good reading. Write to Mr. Jeglum to be put on the mailing list.

* * *

Maybe you aren't a contractor, but if you're interested in water and sewage works, you probably will be interested in the **Contractor's Pump Manual** recently published by the Contractor's Pump Bureau of the Associated General Contractors of America.

The work is based on manufacturers' experience in portable pumps and discusses the selection of the proper kind and size of pump for the particular water moving job at hand. Four types of portable pumps are presented: self-priming, centrifugal, diaphragm, well-point, and road pumps. Advantages and limitations are outlined; a pump selection table is included and maintenance and repair are discussed, along with a pump trouble check sheet, Do's and Don'ts, and tables of useful information and data.

Copies of the manual may be obtained from the Construction Foundation, Associated General Contractors of America, Munsey Bldg., Washington 4, D. C. The price is fifty cents per copy.

* * *

The war was tragic and wasteful and yet some developments came from it. For example, the **Rotameters** of 1941 were hardly those shown and described in a bulletin 45-A by that name, published by Fischer and Porter Co.

Beginning with advantages of the Rotameter for flow rate measurement, this general bulletin 45-A presents photographs, line drawings, and descriptions and specifications of the Master Enclosed Rotameter; the Rotaline armored Rotameter; Recording, Controlling, and Totalizing Rotameters; the Rotasleeve for large flows; Laboratory Rotameters; and a chart of recommendations for type of rotameters

AMERICAN-Standard GAS BOILERS
STEAM AND WATER TYPES
FOR DIGESTER HEATING
SEE DATA PAGE IN ANNUAL REFERENCE SECTION
AMERICAN-Standard
HEATING PLUMBING
Serving the Nations' Health and Comfort
American Radiator & Standard Sanitary Corporation, Pittsburgh 30, Pa.
SALES OFFICES IN ALL PRINCIPAL CITIES

for CONCRETE and STEEL!
Inertol
Protection
Means Lowest Cost
Per Year
INERTOL COMPANY, INC. NEWARK 5, NEW JERSEY and SAN FRANCISCO 7, CALIFORNIA

Leopold
GLAZED FIRE CLAY TILE FILTER BOTTOM
Non-Corrosive—Permanent
DRY CHEMICAL FEEDERS
Accurate—Dependable
also
COMPLETE WATER TREATMENT EQUIPMENT
F. B. LEOPOLD CO., INC.
422 FIRST AVE. PITTSBURGH 19, PA.

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

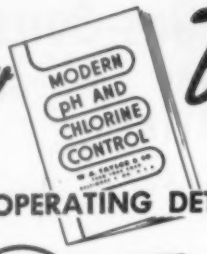
KNOWN AROUND THE WORLD AS THE SIGN OF EXCELLENCE IN WATER TREATMENT EQUIPMENT

The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

GRAVITY FILTERS • SOFTENING PLANTS AND EQUIPMENT • PRESSURE FILTERS ZEOLITE SOFTENERS • SWIMMING POOL RECIRCULATING APPARATUS SPECIAL WATER TREATMENT EQUIPMENT

We invite your inquiries
ROBERTS FILTER MANUFACTURING COMPANY • *Darby, Pa.*

New Book



GIVES OPERATING DETAILS OF

Taylor LIQUITROL

THE MODERN METHOD TO CONTROL pH, CHLORINE AND PHOSPHATE

You Can Use It as a Reference Book

This 88 page book, "MODERN pH AND CHLORINE CONTROL," *just off the press* . . . discusses problems of pH, Chlorine and Phosphate Control . . . describes Taylor Liquitrol Methods, procedures and outfits for water works and sewerage engineers.

You cannot afford to be without this combination reference book and catalog of Taylor Equipment. See your dealer or write direct for your FREE copy.

W. A. TAYLOR AND CO.
7308 YORK RD. • BALTIMORE-4, MD.

CONTACT

LAKESIDE ENGINEERING CORPORATION

Chicago 6 Illinois

222 West Adams St.

FOR

WATER SOFTENING by the Zeolite or Lime-soda methods.

WATER FILTERING to remove Suspended solids, color, odor or taste.

SEWAGE TREATMENT by the Aero-filter which offers all of the advantages of other types of trickling filters plus better momentary distribution.

Spiraflo Clarifier for improved clarification, including scum and oil removal.

for various installations. Bulletin No. 45-A is available from Fischer Porter Co., Hatboro, Penna.

* * *

Knowing that our readers are interested in corrosion and its prevention, we thought you'd like to know that the engineering staff of the U. S. Stoneware Co. has prepared a booklet entitled **Corrosion-Resistant Masonry Material and Construction Manual.** Known as Bull. 810, this 51 page book contains information on acid proof brick, cements, and floors; alkali proof cements; how to use cements; linings; lining tile; plastics; putty; properties of corrosion-resistant cement; paints; a selection guide; and tables of circles, fractions, decimals, and spheres. More than a catalog, this book is a handy reference piece. To bring Bull. No. 810 to your desk requires only a letter to the U. S. Stoneware Co., Akron 9, Ohio.

* * *

In a 20-page booklet, titled **Deaeration,** the Elliot Co. of Jeannette, Pa., have made a restatement of the science of deaeration and its effectiveness in controlling corrosion. Fully illustrated with charts and photographs, the booklet describes corrosion in general and the part which deaeration plays in checking it. Included in the text is a table showing the derivation of the pH factor and a graph indicating the effect of hydrogen ion concentrations (pH values) on the rate of corrosion.

Additional graphs cover the solubility of oxygen and carbon dioxide in water at various temperatures and the solubility of the oxygen component of air in distilled water at various temperatures and pressures. Write to the Elliot Co., Jeannette, Pa., for a copy of this useful booklet.

* * *

What the power engineer needs to know about **Chemical Feed Systems for Water Treatment** was told by Robert T. Sheen, Assoc. Dir. of the Consulting Div. of W. H. & L. D. Betz in *Power Plant Engineering* in May, 1945. The article has been reprinted as Technical Paper No. 51 and distributed by Milton Roy Pumps of Philadelphia.

This paper explains chemical feed systems and how they operate; volumetric, gravimetric, and decanting feeders; controlled volume pumps, materials of construction; proportional feed systems; electric sys-

Replaces "old fashioned" Methyl-Orange Indicator

Samples and literature available upon request

FLEISHER CHEMICAL COMPANY
Benjamin Franklin Station
Washington 4, D.C.

CRISPIN SEWER VALVES

A NEW Pressure Air Release Valve for Sewer Lines

Designed by Crispin, a well-known name in Air Valves for Water Works systems, this new Valve for sewer lines will automatically relieve accumulating air and gases from force mains and other sewage equipment. It is suitable for all pressures up to and including 175 lbs. per square inch.

Outstanding features of the design permit a tight air seal at the top, with the float, actuating the levers, well away from working parts, thereby preventing sludge and other foreign matter from clogging the working parts. The ball rod runs through rollers permitting free action of the float without undue friction.

Inlet sizes are as follows: 2" scr. or flgd., 3" ditto, 4" ditto, 6" flgd. only.

FOR INFORMATION WRITE

MULTIPLEX MFG. CO.
BERWICK, PA.

INSTALLATIONS WORLD WIDE

LARGEST CITY TO SMALLEST VILLAGE

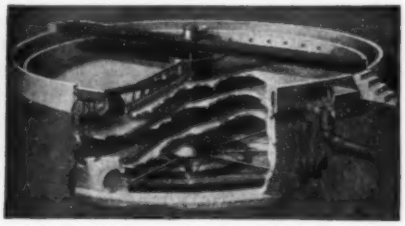
VALVES COMPLETE EQUIPMENT FOR WATER WORKS FILTRATION AND SEWAGE DISPOSAL PLANTS LATEST "COREY TYPE" HYDRANTS

Write for Catalogue and Information

IOWA VALVE CO.

General Offices:
Hubbell Bldg., Des Moines, Iowa

Plant:
Oskaloosa, Iowa



P.F.T. Clarifiers for Rapid Precipitation of Sewage Solids

The P.F.T. Tray Clarifier embodies a design which affects the continuous rapid separation of the solids and liquid in sewage; and the immediate removal of the clarified effluent. A series of shallow settling areas over which the sewage is spread assures speedy precipitation. Its high rate of flow provides maximum capacity in minimum space; reducing the construction and operating costs of clarification equipment.

Write for Bulletin No. 210 containing complete information, including operating results.

P.F.T. Pacific Flush-Tank Company
4241 Ravenswood Ave., Chicago, Ill.
New York Charlotte, N. C.

tems; internal boiler water treatment, and typical plant layouts.

Technical Paper No. 51 may be obtained from Milton Roy Pumps, 1300 E. Mermaid Ave., Chestnut Hill, Philadelphia 18, Pa.

* * *

There's a new 28-page book available from Harnischfeger. Bulletin C9-1 describing **P&H Grab Bucket Cranes,** which are built for service on all types of jobs whether large or small, has been issued recently by the Harnischfeger Corp. Construction details are given, and various applications are illustrated. This equipment is particularly suited for use in large garbage disposal plants as well as the smaller installations—and in sewage works for handling grit. All sizes are built. This book (Bull. C9-1) is available on request. Write the Harnischfeger Corp., Milwaukee 14, Wisc.

* * *

Lest we forget! The August issue of **Lubrication,** published by The Texas Co., was devoted entirely to Greases: Their Characteristics and Uses. This is Part II of the subject, Part I on Manufacture having been presented in the May issue. No doubt you will find Part II of more interest and certainly you should have the information on Precautions in Handling Greases, and the schedule of Texaco Lubricants Recommended for Ball and Roller Bearings. You'll find the rest of the book helpful, too. Write to The Texas Co. at 135 E. 42nd Street, New York 17, N. Y., and ask for the August issue of **Lubrication.**

* * *

Just in case you're interested in diesel or gasoline power, you'll want to write the Sterling Engine Co., 1270 Niagara Street, Buffalo 13, N. Y., and ask for their folder, **Power by Sterling,** showing the six, eight and twelve cylinder models available for gasoline, gas or butane, and the diesel engines as well.

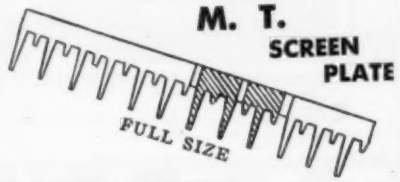
* * *

What is the old saying: "You scratch my back and I'll scratch yours"? It is hereby noted that in the Sept.-Oct. issue of the **Pittsburgh Empire Water Journal** of the Pittsburgh-Equitable Meter Co., there is an item in a column devoted to *Splatterings,* which quotes from our "Here and There with Doc Symons" anent the Miami Sewage Works. There are other reasons why

FINE SCREENS FOR SEWAGE TREATMENT

ADVANCED DESIGN
AND CONSTRUCTION
COMPLETE INSTALLATIONS

THE NEW **M. T.** SCREEN PLATE



ROLLED OR EXTRUDED
AT THE MILL IN STAINLESS
STEEL OR "EVERDUR"
HIGHER STRENGTH
HIGHER EFFICIENCY
LOWER COST AND UPKEEP

M. T. SCREENS IN LARGER SIZES FOR WATER FILTER BEDS—NO LARGER SIZES OF GRAVEL OR OTHER FILTER MATERIAL REQUIRED—CLEANING AND BACK-WASHING SIMPLIFIED.

SANEQUIPMENT ENGINEERING
2843 WHITEWOOD AVE.
ANN ARBOR, MICHIGAN

LEADITE

The Pioneer Self-Caulking Material for C.I. Pipe

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia, Pa.

No Caulking

INCINERATION ENGINEERS
NICHOLS ENGINEERING & RESEARCH CORPORATION
60 WALL TOWER NEW YORK, N. Y.
Consultants • Designers • Constructors

TAPAX
The ORIGINAL and FINEST....
Manhole Cushion U. S. Pat. No. 2,050,050 offers you the simplest solution for noisy, rattling covers. Easy to install. Lasting — Economical.
Write for story of Tapax and Trial Offer.
TAPAX MFG. CO., INC.
MAMARONECK NEW YORK

SAVE MONEY USE ACTIVATED ALUM and BLACKALUM
STUART-BRUMLEY CORP.
516 North Charles St.
Baltimore Maryland

SAVE with TENNESSEE CORPORATION ferri-floc FERRIC SULPHATE
Write today for actual case histories of plants now using the ideal ferric coagulant.
TENNESSEE CORPORATION
Atlanta, Georgia Lockland, Ohio

we like to read the Water Journal—it always contains good technical articles as well as interesting information and some good stories as well. If you're not on the mailing list, write to Pittsburgh-Equitable Meter Co., Pittsburgh, Pa.

* * *

Leopold Filter Bottoms (Bulletin G.F.C.-101) of the F. B. Leopold Co., Inc., contains a concise statement about the Duplex Filter Bottom and its many advantages. Bulletin G.F.C.-101 also shows details of the blocks of vitrified Glazed Clay and drawings showing typical layouts for large filters using a central gullet, and for small filters with front gutter. Also shown are drawings of sections through the Duplex Filter Bottom Blocks, and details of the joint. If you want to know more about these Filter Bottoms, and you should, write to the F. B. Leopold Co., Inc., Pittsburgh, Pa.

* * *

Because of difficulties beyond our control with printing, we haven't been able to tell you that in the Sept.-Oct. issue of **Lead**, published by the Lead Industries Association, New York, N. Y., there is an abstract of an article from the August issue of the *AWWA Journal* on the survival of lead services in Denver, Colo. Covering the entire distribution system, and going back to 1872, the survey shows over 90 per cent survival for more than sixty years.

This copy of **Lead** also contains a story on lead calked cast-iron pipe being used as a siphon around a collapsed masonry sewer in Syracuse, N. Y. Twenty-inch C.I. pipe from the Water Dept. was used, and a Worthington pump scheduled for the Netherlands' government was borrowed to prime the siphon. It worked; the 350 ft. line along the curb carried the sewage under a 19 ft. negative head and averted serious flooding and damage.

* * *

There are a great many persons who never think about the use of air compressors around water or sewage works. In fact, if you were to ask them, they'd say there was no connection between the two. Well, those persons never stop to think about the use of compressors in drilling rock or tamping backfill in water main and sewer trenches. And one fellow we know successfully uses an air tool for caulking lead joints in cast iron mains; still another uses it as a sub-aqueous trencher, and yet another as a means of cleaning water mains. We could go on and on, but think we ought to tell you that what reminded us of these things were two bulletins from the Worthington Pump and Machinery Corp. of Holyoke, Mass. The first of these is titled **105′ Streamlined Portable Compressor,** and the other is **Accessories for Rock Drills and Air Tools.** These portable compressors are known as Blue Brutes. Write for a catalog.

* * *

Prepared for engineers and others engaged on sewage treatment problems and plant layouts for both large and small communities, Bull. No. 287A, **Measurement, Control, and Chemical Treatment of Sewage and Sludge** contains 20 pages of useful and interesting information.

This new edition of an "old friend," issued by Builders-Providence, Inc., (Div. of Builders Iron Foundry) contains descriptions and illustrations of chemical feeders and new types of indicating, recording, and integrating flow instruments for connection to such primary units as Venturi Tubes, Orifices, Kennison Nozzles, Parshall Flumes and Conveyor Scales.

You may not need any of this equipment tomorrow, but there are several useful reference diagrams and, besides, it's a good idea to have the information at hand when you do want it. Write today to Builders-Providence, Inc., 9 Codding St., Providence, R. I.

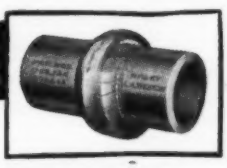
* * *

Some of you chemists, who like to make your own reagents, solutions, and concoctions may be in-

EDSON
DIAPHRAGM PUMPS
Hand Sizes 2", 2½", 3", 4"
Power Sizes 3" and 4"
Open Discharge or Force Pump
Edson Special Suction Hose
Red Seal Diaphragms
Strainers and Foot Valves
Hose Spanners—Adapters
THE EDSON CORPORATION
Main Office and Works: 49 D St.
South Boston, Mass.
New York: 142 Ashland Pl., Brooklyn

ANTHRAFILT
A Filter Medium For All Purposes
ANTHRACITE EQUIPMENT CORP
101 Park Ave. New York
C. E. PALMER
Engineer and Sales Representative
822 E. 8th STREET, ERIE, PA.

WESTON



GASKET AND FORM
The Perfected Method for Making Sewer Pipe Joints of Cement
• No jute used—gasket centers spigot.
• Definite space in each joint for cement.
• Form confines cement-grout to lower portion of joint.
• Particularly advantageous in water-bearing trenches.
• Infiltration minimized.
L. A. WESTON Adams, Mass.

ZECO GREENSAND ZEOLITE
ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.
ZEOLITE CHEMICAL CO.
Sales Office 140 Cedar St. New York, N. Y.
Factory Medford, N. J.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

terested in Editor Harry Bennett's **Chemical Formulary, Vol. VII,** published by the Chemical Publishing Co., Brooklyn, N. Y. Priced at $6 this book contains the recipes for making a wide variety of things easily and inexpensively at home, in the factory, shop, or laboratory. You don't have to be a chemist to use it, and some of you just plain putterers may find in the book just what you are looking for, from insect sprays, adhesives, and rust preventers, to cosmetics, fertilizers, and meat preservatives. (What meat?) Or if you have nothing to do but polish the bright work in your plant, maybe you'd like to make your own cleaner and polish, and so on and so forth, etc., etc., etc.

* * *

Over at Philadelphia at the Franklin Institute is a mechanical exhibit of a working model of a chlorine-alkali plant in actual operation. Of course, all you folks who use chlorine and would like to know how it is produced can't go to the Franklin Institute, so the Pennsylvania Salt Co., who prepared the exhibit, has issued a booklet called **Salt of the Earth,** in which is shown a photographic reproduction of the model. Also shown in the booklet, which is free for the asking, are sections of the model to help clarify the descriptions of the various processes.

A three dimensional model of the chlorine atom is part of the exhibit and the booklet shows some of the current conceptions of the chlorine atom and the origin of the chemical and physical properties of this element. Write the Pennsylvania Salt Co., 1000 Widner Bldg., Philadelphia 7, Pa., for one of these booklets; you'll find it interesting.

* * *

The purpose of **Filters for the Process Industries** (Bull. 214) of the Oliver United Filters, Inc., 33 W. 42nd St., New York 18, N. Y. is largely introductory to acquaint operators and engineers of process plants with the many types of Oliver United Filters. As such it covers many filters of no particular interest to water or sewage works. On the other hand, the bulletin does contain some information on the Oliver Chemical filter of the type generally used for filtering sludge, and on acid handling and diaphragm slurry pumps. This latter pump has not seen service in sewage plants but might well be considered as a means of handling sewage sludge.

THE Phipps & Bird LABORATORY MIXER . . .

IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.
PHIPPS & BIRD, INC. Richmond, Va.

BAILEY METERS AND CONTROLLERS
FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

● Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.
BAILEY METER COMPANY
1072 IVANHOE ROAD • CLEVELAND O.
Bailey Meter Co. Ltd., Montreal, Canada

* * *

Some time ago the C. H. Stoelting Co. of 424 N. Homan Ave., Chicago 24, Ill., sent us a copy of a new bulletin No. 1100 on **Electric Timers,** but lack of space prevented us from mentioning it. Knowing that a great number of your water and sewage plant operators and chemists have occasion to use a timer we thought you'd like to know about this bulletin which describes table models and wall models of timers, chronscopes, impulse counters and stop watch controllers.

POSITION WANTED
By graduate Chemical and Sanitary Engineer with twenty years comprehensive experience in water purification. Also supervision, maintenance, and operation of wastes, sewage treatment and water conditioning plants, municipal and industrial. Now employed, but available in 90 days. Box 1368, Water Works & Sewerage, 155 E. 44th St., New York 17, N. Y.

POSITION WANTED
ENGINEER (Design and Construction)—Graduate C.E. (Cornell), experienced not alone in sanitary engineering, but also in general engineering and especially building, design and construction. Conn. registrant and resident, prefers East but will consider moving to South or Southwest. Address H.F.P.. c/o Water Works & Sewerage, 155 East 44th Street, New York 17, N. Y.

Consulting Engineers

Specializing in the field of

WATER WORKS & SEWERAGE

ALBRIGHT & FRIEL, INC.

Consulting Engineers

Water, Sewage and Industrial Waste Problems — Airfields, Refuse Incinerators, Power Plants — Industrial Buildings
City Planning - Reports - Valuations

Laboratory

1520 Locust Street, Philadelphia 2

Alvord, Burdick & Howson

Engineers

Charles B. Burdick
Louis R. Howson
Donald H. Maxwell

Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation

Civic Opera Building — Chicago

Michael Baker, Jr.

The Baker Engineers

CIVIL ENGINEERS AND PLANNERS
MUNICIPAL ENGINEERS

Airport Design—Sewage Disposal Systems
Water Works Design and Operation
Consulting Services - Surveys and Maps

HOME OFFICE—ROCHESTER, PA.

Black & Veatch

Consulting Engineers

4706 Broadway, Kansas City, Mo.

Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigations, Reports and Laboratory Service

E. B. Black — N. T. Veatch, Jr.
A. P. Learned — H. F. Lutz
F. M. Veatch — R. E. Lawrence
E. L. Filby — J. F. Brown

BOGERT-CHILDS ENGINEERING ASSOCIATES

CONSULTING ENGINEERS

Clinton L. Bogert — Fred S. Childs
Howard J. Carlock — Arthur P. Ackerman
John M. M. Greig — Robert J. McCarthy

Water Supply and Purification
Sewerage and Sewage Treatment
Flood Control and Drainage
Refuse Disposal
City Planning—Investigations—Reports

624 Madison Avenue, New York 22, N. Y.

Buck, Seifert and Jost

Consulting Engineers

(Formerly Nicholas S. Hill Associates)

Water Supply, Sewage Disposal, Hydraulic Developments, Reports, Investigations, Valuations, Rates, Design Construction Operation, Management, Chemical and Biological Laboratories

112 East 19th St. — New York

Burns & McDonnell

Engineering Co.

McDONNELL-SMITH-BALDWIN-TIMANUS-McDONNELL

Consulting Engineers Since 1897

Waterworks, Light and Power, Sewerage, Reports, Designs, Appraisals, Rate Investigations

Kansas City, Mo., 107 West Linwood Blvd.

THOMAS R. CAMP

Consulting Engineer

6 Beacon Street, Boston 8, Mass.

Water Works and Water Treatment; Sewerage and Sewage Treatment; Municipal and Industrial Wastes; Investigations and Reports; Design and Supervision; Research and Development; Flood Control.

The Chester Engineers

Campbell, Davis & Bankson

Water Supply and Purification, Sewerage and Sewage Treatment, Power Development and Applications, Investigations and Reports, Valuations and Rates.

210 E. Park Way at Sandusky, Pittsburgh 12, Pa.

Collins Engineering Company

—Consulting Engineers—

Water Supply, Purification, Sewerage, Sewage Treatment, Refuse Disposal, Industrial Wastes, Street Paving, Storm Drainage

326 Arnote Building — McAlester, Oklahoma
314 Gilbert Building — Ardmore, Oklahoma

DE LEUW, CATHER & COMPANY

Water Supply — Sewerage
Railroads — Highways
Grade Separations—Bridges—Subways
Local Transportation

Investigations — Reports — Appraisals
Plans and Supervision of Construction

20 North Wacker Drive — Chicago

FAY, SPOFFORD & THORNDIKE

Engineers

Charles M. Spofford

John Ayer — Carroll A. Farwell
Blon A. Bowman — Ralph W. Horne

Water Supply and Distribution — Drainage
Sewerage and Sewage Treatment—Airports
Investigations and Reports
Designs — Valuations
Supervision of Construction

Boston — New York

Edward A. Fulton

Consulting Engineer

Investigations, Reports, Valuations, Design and Construction—Water Supply and Purification Plants, Sewerage and Sewage Treatment Works; Municipal Paving and Power Developments.

3 So. Meramac Ave.
St. Louis, Mo.

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

Harrisburg, Pa. — New York, N. Y.

ENGINEERS

Water Works, Sewage, Industrial Wastes & Garbage Disposal—Roads, Airports, Bridges & Flood Control. Town Planning, Appraisals, Investigations & Reports.

I. M. Glace

Consulting Sanitary Engineer

WATER SUPPLY AND PURIFICATION
SEWERAGE AND SEWAGE TREATMENT

Specializing in Water Quality Problems

Telephone 6-0407 — 1001 North Front St. Harrisburg, Pa.

Greeley and Hansen

Engineers

Samuel A. Greeley — Paul Hansen
Paul E. Langdon — Kenneth V. Hill
Thomas M. Niles — Samuel M. Clarke

Water Supply, Water Purification, Sewerage, Sewage Treatment, Flood Control, Drainage, Refuse Disposal

6 N. Michigan Ave., Chicago

Havens and Emerson

W. L. Havens — C. A. Emerson
A. A. Burger — F. C. Tolles — F. W. Jones

Consulting Engineers

Water, Sewage, Garbage, Industrial Wastes, Valuations — Laboratories

Leader Building, Cleveland 14 — Woolworth Bldg. New York 7

Hayden, Harding & Buchanan

Consulting Engineers

John L. Hayden — Gordon E. MacNeill
John H. Harding — Oscar J. Campia

Waterworks, Sewerage, Civil, Mechanical, Electrical, Structural

662 Park Square Building, Boston, Mass.

Charles Haydock

Consulting Engineer

Water Works and Sanitation, Industrial Wastes, Design, Construction, Operation and Management. Reports and Valuations.

COMMERCIAL TRUST BUILDING
PHILADELPHIA 2

JONES & HENRY

Formerly H. P. JONES & CO.

Harvey P. Jones — Thomas B. Henry

Consulting Engineers

Reports, Designs, Supervision, Valuation

Water Supply — Refuse Disposal
Water Purification — Industrial Wastes
Sewerage — Flood Control
Sewage Treatment — Drainage

606 Toledo Trust Bldg. — Toledo 4, Ohio

Morris Knowles, Inc.

Engineers

Water Supply and Purification, Sewerage and Sewage Disposal, Valuations, Laboratory, City Planning

1312 Park Building, Pittsburgh, Pa.

Consulting Engineers

Specializing in the field of

WATER WORKS & SEWERAGE

Charles D. Lehman
Consulting Engineer
Water Supply and Distribution
Investigations, Reports, Supervision
Alarm Systems and Communications
Post-War Plans—Surveys—Operations
Box 257 Flossmoor, Ill.

Wm. S. Lozier, Inc.
Consulting Engineers
Wm. S. Lozier - C. E. Elmdorf - A. B. Squire
Sewerage, Sewage Disposal, Water Supply, Water Purification, Refuse Disposal
10 Gibbs Street, Rochester, N. Y.

Metcalf & Eddy
Engineers
Water, Sewage, Drainage, Refuse and Industrial Waste Problems
Airfields Valuations
Laboratory
Statler Building, Boston

MURRAY LABORATORY
25 years experience
Consulting—Analytical—Chemist—Bacteriologist. Municipal and Industrial Water Supplies
Bacteriological — Chemical — Sanitary — Mineral Analyses. Reports and Treatment Recommendations.
Capers Bldg.—Greenville, South Carolina

Nussbaumer and Clarke
Newell L. Nussbaumer Irving Clarke
Water Supply and Treatment
Sewerage & Sewage Disposal
Garbage Incineration
Town Planning
327 Franklin St. Buffalo, N. Y.

Parsons, Brinckerhoff, Hogan & Macdonald
Formerly: Parsons, Klapp, Brinckerhoff & Douglas
Engineers
Traffic Reports Valuations Harbor Works
Power Developments Industrial Buildings
Bridges Tunnels Subways Foundations
Dams Water Works Sewerage
142 Maiden Lane, New York 7
Calle Sur 17 No. 27, Caracas, Venezuela
Avenida Presidente Wilson 164, Rio de Janeiro, Brazil

Malcolm Pirnie
Engineers
Water Supply, Treatment, Sewerage
Reports, Plans, Estimates
Supervision and Operation
Valuation and Rates
25 W. 43rd St., New York, N. Y.

The Pitometer Company
Engineers
Water Waste Surveys, Trunk Main Surveys, Water Distribution Studies
Penstock Gaugings
New York, 40 Church St.

ROBERT T. REGESTER
Consulting Engineer
Sewerage—Sewage Treatment
Water Works—Industrial Wastes
Flood Control—Fire Protection
Advisory Service, Reports and Designs
Baltimore Life Building
Baltimore, Md.

Thomas M. Riddick
Consulting Engineer and Chemist
Municipal and Industrial Water Purification, Sewage Treatment, Operating Supervision of Plants, Sanitary Surveys, Stream Pollution Investigation, Swimming Pool Control, Chemical and Bacteriological Analyses, Testing of Materials.
369 East 149th Street, New York City

ROBERT AND COMPANY
Incorporated
Architects and Engineers
ATLANTA, GEORGIA
Water Supply Incinerators
Sewage Disposal Power Plants

Russell & Axon
Geo. S. Russell—John C. Pritchard
Joe Williamson, Jr. — F. E. Wenger
Consulting Engineers, Inc.
Sewerage, Sewage Disposal, Water Works, Filtration, Softening
Power Plants
6835 Delmar Blvd University City 5, Mo.

J. E. Sirrine & Company
Engineers
Water Supply & Purification
Sewage & Industrial Waste Disposal
Stream Pollution Reports
Utilities, Analyses
Greenville South Carolina

WHITMAN, REQUARDT AND ASSOCIATES
Engineers — Consultants
Civil—Sanitary—Structural—Mechanical—Electrical. Reports, Plans, Supervision, Appraisals
1304 St. Paul Street
Baltimore 2, Maryland

Benjamin L. Smith & Associates
Engineers
(Formerly Whitman and Smith)
Investigations — Reports
Designs — Supervision — Valuations
Municipal Engineering and Public Utilities
11 North Pearl Street
Albany 7, New York

STANLEY ENGINEERING COMPANY *Consulting Engineers*
Water Works — Sewerage
Electric Power — Flood Control
Rate Studies—Valuations—Industrial
Airports . . . Municipal Buildings
Hershey Bldg., Muscatine, Ia.

PHILIP B. STREANDER AND AFFILIATES
CONSULTING SANITARY ENGINEERS
Damon and Foster, Engrs.
Sharon Hill, Del. Co., Pa.
Cleverdon, Varney & Pike, Engrs.
120 Tremont St., Boston 8, Mass.
Water Supply, Treatment, Distribution
Trade Wastes, Refuse Disposal
Sewerage, Sewage Treatment
Plans, Supervision, Reports

Westcott & Mapes, Inc.
Architects and Engineers
Sewage Disposal
Garbage and Refuse Incineration
Public Utilities
Reports Plans Specifications
NEW HAVEN CONN.

Weston & Sampson
Water Supply, Water Purification, Sewerage, Sewage and Industrial Waste Treatment, Corrosion Control, Laboratory Service, Supervision, Valuations
14 Beacon St. Boston, Mass.

Whitman & Howard
Engineers (Est. 1869—Inc. 1924)
Channing Howard Paul F. Howard
Walter A. Janvrin C. Roger Pearson
Water Supply, Water Purification, Sewerage, Sewage Disposal, Water Front Improvements and all Municipal and Industrial Development Problems, Investigations, Reports, Designs, Supervision, Valuations.
89 Broad St., Boston, Mass.

BUY MORE VICTORY BONDS

THERE WILL BE

SMOKE ON THE SKY

IN 1946

—Smoke that means new products for a Nation at Peace—smoke that means fulfilling the needs of some 130 million American citizens. Manufacturers have never before faced such a golden opportunity for tremendous sales volume and a ready cash market. But remember, Water will be one of your most important manufacturing necessities.

Now is the time to plan and put in a modern high efficiency Layne Well Water System—a system that will produce great quantities of water at an extra low cost. No investment you can make will show a greater dividend in savings and satisfaction.

In buying a Layne Well Water System you are obtaining the very finest made. You are assuring yourself of long lasting quality and trouble free operation.

If you wish counsel on preliminary plans for a Layne Well Water System, ask for the cooperation of Layne engineers, which is obtainable without obligation. For illustrated literature, address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

HIGHEST EFFICIENCY

Layne Vertical Turbine Pumps are now available in sizes to produce from 40 to 16,000 gallons of water per minute. Their high efficiency saves hundreds of dollars on power cost per year.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply Ltd., London, Ontario, Canada * Layne-Hispano Americana, S. A., Mexico, D. F.

LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

Index TO ADVERTISERS

Albright & Friel, Inc. 126
Allen Billmyre Co. 98
Aluminum Co. of Amer. 23
Alvord, Burdick & Howson 126
American Brass Co. 42
American Radiator & Standard Sanitary 121
Anthracite Equipment Co. 125
Atlas Mineral Products Co. of Pa., The 13
American Well Wks. 18
Aurora Pump Co. 109

Baker Jr., Michael 126
Black & Veatch 126
Bogert-Childs 126
Bridgeport Brass Co. 9
Buck, Seifert and Jost 126
Buffalo Gasolene Motor Co. 110
*Builders Iron Foundry 109
*Builders-Providence, Inc. 109
Burns & McDonnell 126
Byers Co., A. M. 15

*Calgon, Inc. 35
Camp, Thos. R. 126
Carter Co., Ralph B. 32
Cast Iron Pipe Research Assn. 37
Cement Gun Co. 117
Centriline Corp. 22
Chain Belt Co. 104
Chester Engineers, The 126
*Chicago Bridge & Iron Co. 27
*Chicago Pump Company 97
Clayton Mfg. Co. 29
Collins Engineering Co. 126

Darco Corp. 119
De Laval Steam Turbine Co. 24
DeLeuw, Cather & Co. 126
Diamond Alkali Company 39
Dorr Company, Inc., The ..... Third Cover

Eddy Valve Co. 116
Edson Corporation, The 125

Fay, Spifford & Thorndike 126
Fisher Research Laboratory 118
Fleisher Chem. Co. 122
*Flexible Sewer Rod Equipment Co. 103
*Flexible Underground Pipe Cutting Co. 103
Fulton, Edw. A. 126
Ford Meter Box Co. 118

Gannett, Fleming, Cordy & Carpenter, Inc. 126
General Chemical Co. 28
*General Paint Co. 114
General Electric 16-17
Glace, I. M. 126
*Golden-Anderson Valve Spec. Co. 120
Gorman-Rupp Co. 26
Greeley & Hansen 126

Havens & Emerson 126
Hayden, Harding & Buchanan 126
Haydock, Chas. 126
*Hill, Hubbell & Co. 114
Homelite Corp. 30
Hays Mfg. Co. 101
Hellige, Inc. 120
Hooker Electrochemical Co. 103
Hydraulic Development Corp. 118

Inertol Co. 121
*Industrial Chemical Sales 31
*Infilco, Incorporated 109
Iowa Valve Co. 123

Johns-Manville 38
Jones & Henry 126
Josam Mfg. Co. 98

Knowles, Inc., Morris 126

Lakeside Engr. Co. 122
Lapp Insulator Co. 11
Layne and Bowler, Inc. 128
Leadite Company, The 123
Leopold Co., F. B. 121
Lehman, Chas. D. 127
Leupold & Stevens 43
Lock Joint Pipe Co. 7
Lozier, Inc., Wm. S. 127

McAlear Mfg. Co. 41
Mathews Hydrants 12
Mathieson Alkali Wks. (Inc.) 25
Metcalf & Eddy 127
Morris Machine Co. 109
Mueller Co. 6
Multiplex Mfg. Co. 122
Murray Laboratory 127

National Clay Pipe Mfrs., Inc. 113
Neptune Meter Company 46
Niagara Alkali Co. 19-20
*Nichols Engr. & Research Corp. 124
Norwood Engr. Co., The 108
Nussbaumer & Clarke, Inc. 127

Omega Machine Co. (Division of Builders Iron Fdry.) 116

*Pacific Flush-Tank Company 123
Parsons, Brinckerhoff, Hogan & Macdonald 127
Peerless Pump Division (Food Machy. Corp.) 105
*Pennsylvania Salt Mfg. Company ..... Second Cover
*Permutit Co., The 101
Phipps & Bird, Inc. 125
*Philadelphia Quartz Co. 102
Pirnie, Malcolm 127
Pitometer Co., The 127
Pittsburgh Equitable Meter Company 3
Pittsburgh-Des Moines Steel Co. 36
*Pittsburgh Plate Glass Co. (Columbia Chemical Div.) 21-115
Portland Cement Ass'n 10
*Proportioneers, Inc. 44

Regester, Robt. T. 127
*Rensselaer Valve Co. 117
*Riddick, Thomas M. 127
Ridge Tool Co. 98
Robert & Co. 127
Roberts Filter Mfg. Co. 121
Rodney Hunt Mach. Co. 120
Roots-Connersville Blower Corp. 107
*Ross Valve Mfg. Co. 119
*Rover Fdry. & Mach. Corp. 33
Russell & Axon 127

Sanequipment Engineering 123
Simplex Valve & Meter Co. 99
Sirrine & Co., J. E. 127
Smith & Associates, Benj. L. 127
Smith Mfg. Co., The A. P. 34
Smith Co., S. Morgan 8
Solvay Sales Corp. 106
Stacey Bros. Gas Constr. Co. 112
Stanley Engineering Co. 127
Streander, Philip B. 127
Stuart Brumley Co. 124

Tapax Mfg. Co., Inc. 124
Tate Pipe Linings, Inc. 111
Taylor & Co., W. A. 122
*Tennessee Corp. 124
Thomson Meter Company 46

U. S. Pipe & Fdry. Co. 40

Vogt Brothers Manufacturing Co. 120
Vogt Manufacturing Co. 120

*Wallace & Tiernan Co., Inc. ..... Back Cover
Warren Foundry & Pipe Corp. 111
Wescott & Mapes, Inc. 127
Westinghouse Electric Corp. 4-5
Weston, L. A. 125
Weston & Sampson 127
Whitman & Howard 127
Whitman, Requardt & Associates 127
Wood Co., R. D. 12
Worthington Pump & Machy. Corp. 14

Zeolite Chemical Co. 125

*Advertisers with * were represented in the June, 1945, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on behalf of their products.

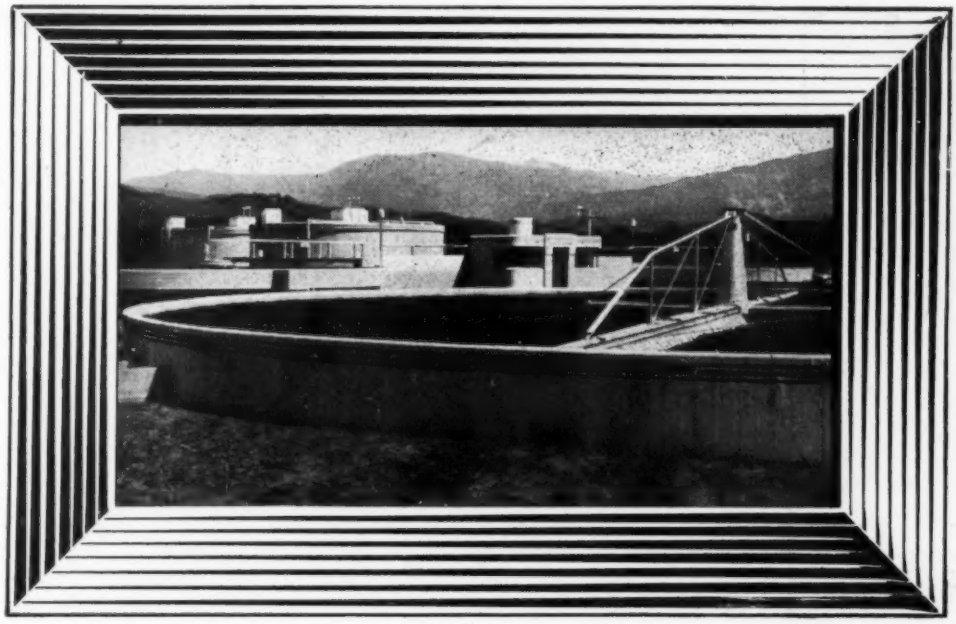
The Dorrco Distributor

DIFFERENT *in design*

DIFFERENT *in performance*

WITH box-shaped, tapered arms that provide high capacity for operation at low heads, the Dorrco Distributor departs from the conventional in design.

Individual spreaders with adjustable orifices insuring even distribution and coverage, and anti-sway ball bearings (at base rather than top of column for smoother operation) explain in part why Dorrco Distributors are surpassing conventional *performance* in sewage treatment plants from coast to coast.



The arms of a Dorrco Distributor are not limited to commercial pipe sizes. With either two or four fabricated arms, the Distributor is designed hydraulically correct for any desired flow. Arms may have two compartments, the lower taking up to average flow and the upper maximum flows. Because of its design, it is capable of handling very high dosing rates. Other distinctive features include protection against loss of mercury in the seal from unusual surges.

Investigate the Dorrco Distributor for greater flexibility and greater efficiency in your trickling filter installation.

We will gladly furnish more information to consulting engineers. Write or call our nearest office.

Check its ADVANTAGES

Variable flows at low head — 24 inches. Maximum capacity per unit of bed area — 63 M. G. D. per acre per day.

• Complete coverage of bed twice each revolution. • Constant sewage velocity throughout arms due to tapered construction. • Special anti-fouling slotted orifices with adjustable distribution plates. • Mercury catch-well to avoid loss due to excessive pressure surges. • Anti-sway ball bearings in base of column instead of top.

795

Blueprint Yours!

DORR

RESEARCH · ENGINEERING · EQUIPMENT

ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

DORRCO

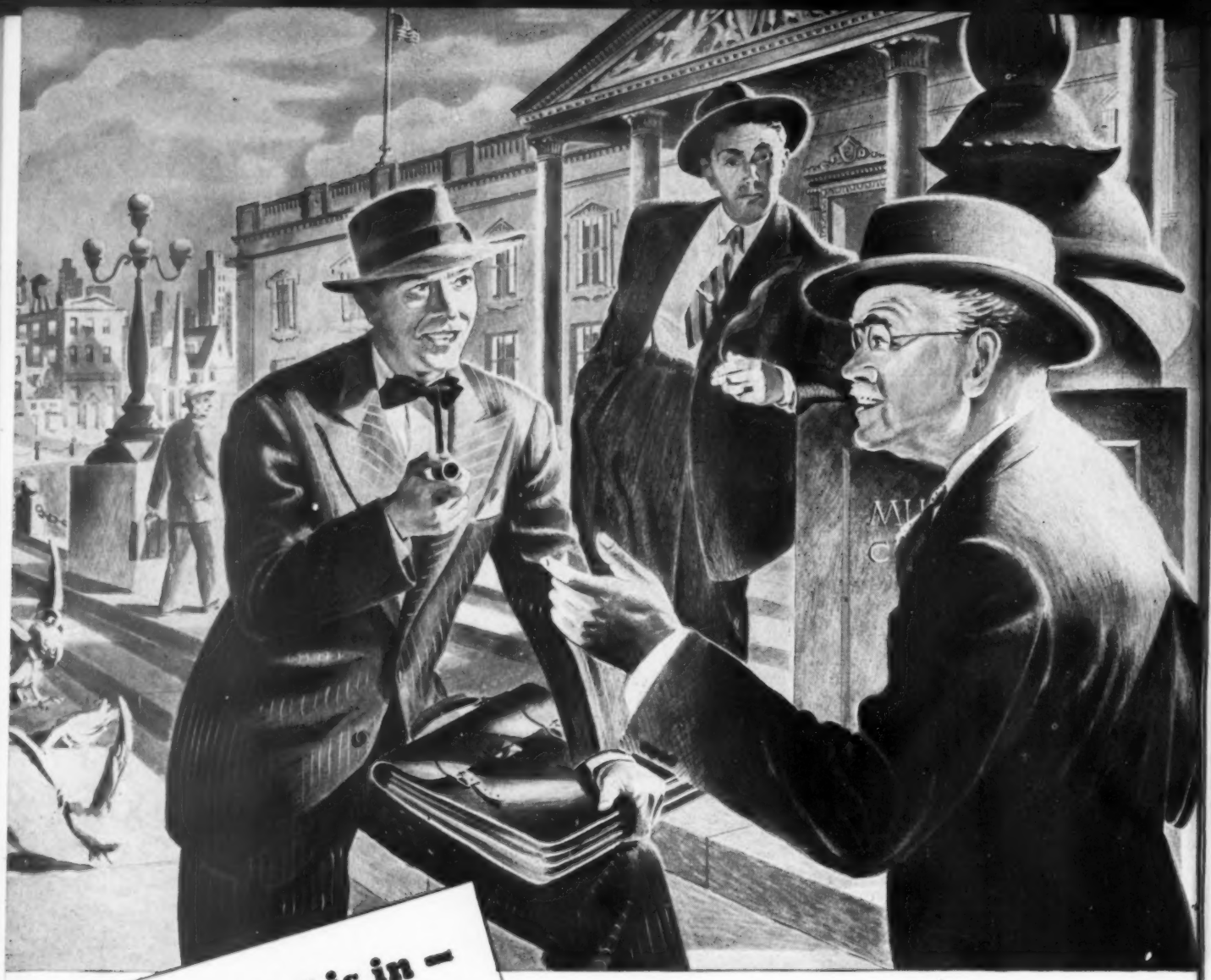
THE DORR COMPANY, ENGINEERS

NEW YORK 22, N. Y. . . . 570 LEXINGTON AVE.
ATLANTA 3, GA. . . . WILLIAM-OLIVER BLDG.
TORONTO 1, ONT. . . . 80 RICHMOND ST. W.
CHICAGO 1, ILL. . . . . 221 NO. LA SALLE ST.
DENVER 2, COLO. . . . . COOPER BUILDING
LOS ANGELES 14, CAL. . . . 811 WEST 7TH ST.

RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.

SUGAR PROCESSING

PETREE & DORR DIVISION
570 LEXINGTON AVE., NEW YORK 22, N. Y.



The Verdict is in —

NOW IS THE TIME FOR *Action*

Proof of the extra protection afforded by *free available chlorine residuals* is fully established. Now is the time for action in applying such residuals to your water supply. Now is the time for action which can eliminate all gas-formers all of the time.

Your Wallace & Tiernan Representative will give you full information on treatment to maintain and tests to control *free available chlorine residuals* throughout the water system. Why not let him work with you to establish this extra protection as a regular part of your water treatment?

WALLACE & TIERNAN COMPANY, INC.

Manufacturers of Chlorine and Ammonia Control Apparatus
Newark 1, New Jersey • Represented in Principal Cities

SA-191